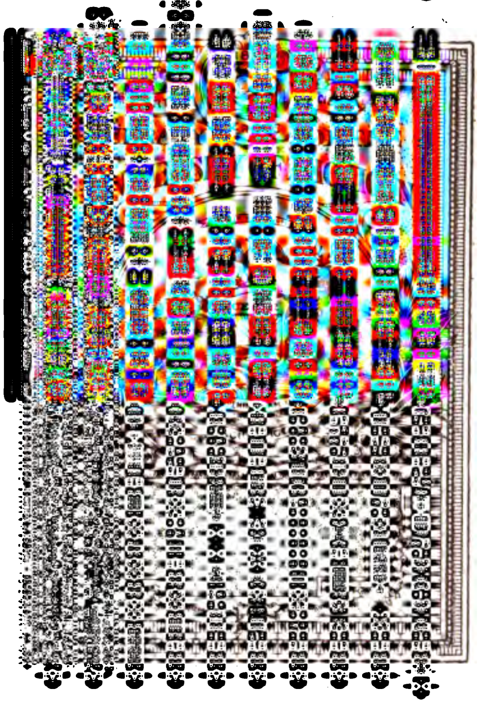

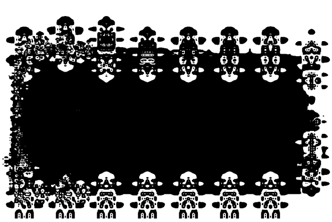

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TIMEHRI

BEING

THE JOURNAL

OF

The Royal Agricultural & Commercial Society

OF

BRITISH GUIANA.

Edited by . . . . E. F. IM THURN, M.A.

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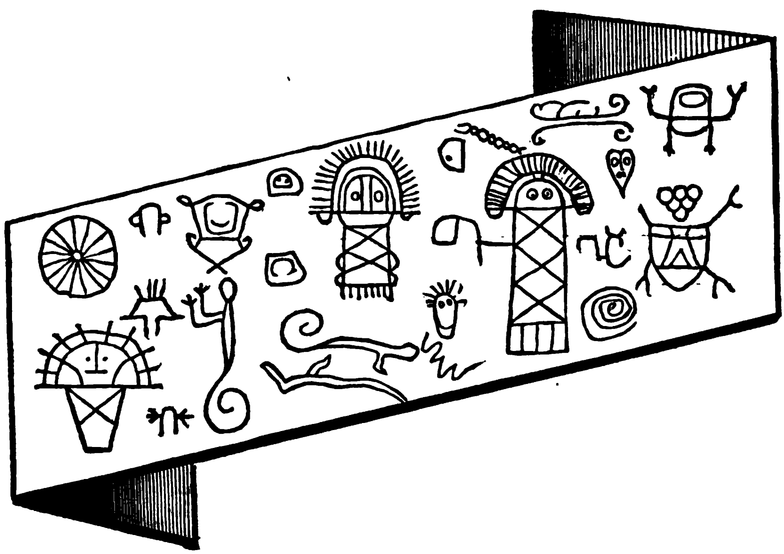

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Contents of Volume I.

An Editor's Prologue.

WE feel bound in our editorial—the gods forbid that we should ever be obliged to do so in our private—capacities to account for our existence. This we will try to do as briefly as possible.

The Society, of which this Journal is to be the organ, has been in existence since 1844; and one of its avowed objects has been the "establishing and carrying on of a periodical publication as the organ of the Society."

Seeing that up to this year 1882 no such organ has ever been published, it is certainly time to begin. But that man, or that body of men, being clearly awkwardly placed when compelled by any rule to write while there is nothing to write about, our duty evidently is to show that we have a story to tell.

In a new country such as ours, ever since its discovery many new facts worthy of permanent record have constantly been learned and still constantly are learned. But as yet with us such facts have gained attention perhaps for a month, or even it may be for a year, only to be then immediately forgotten. To take only the last half century; the brothers SCHOMBURGK traversed the colony from end to end, most busily collecting and observing; CARL APPUN worked here too, much

in the same way; and on smaller and yet more forgotten occasions various scientific exploring expeditions have travelled through the land. Meanwhile our Society has at various times been the means of publishing information about the colony by gathering its products together at Exhibitions, by causing essays to be written on various themes, by discussing matters of local interest at its meetings—though this it has done far too seldom,—and by publishing pamphlets written by its more technical or learned members. Yet how many of us know anything of the results of all this enterprise? Or where could any one of us, regretting his ignorance of such matters, turn and find a record of what has been done in this way?

Having led up to these questions, which it will be obvious that we ask with just that feeling of pleasure, so irritating to the questioned, which is the reward of those who ask questions to which they feel no satisfactory answer can possibly be given, we may at once state that our purpose is to put on record in future all information of the kind indicated above, in a form which, perhaps with far too great conceit, we flatter ourselves will be permanent; and as regards the past, we propose to rescue and store up, as fast as time and opportunity allow, so much of the half or wholly forgotten collected facts as may yet be rescued. Moreover, we feel sure that the very fact of the existence of this means of permanent record will encourage those who would not gather and give information which they know was only to be lost, to set to work and increase the store of our knowledge of the colony. And to this end

we here earnestly entreat all those who can, to come forward and tell, through our pages, the history of the colony in all its aspects,—industrial, scientific and historic. A certain very learned and very conceited head of an Oxford College, was recently represented as having exclaimed :—

> "I am the Master of the College,
> What I don't know isn't knowledge."

Here in this colony, where there are so many matters never yet recorded, and where there are so many individuals with special knowledge, each of some particular subject, let each of these specialists remember that what he does know is often not knowledge to any but himself, and let him set the same down on paper as nicely as he can and send it to us, that we may impart it to his fellow-colonists.

We are reminded that we still have to account for our name.

It was at first intended to call our publication simply "The Journal of the Royal Agricultural and Commercial Society of British Guiana." But there were several objections to that. In the first place that title is inconvenient as being more than one mouthful for one man, as was the title of a Society with which we were once acquainted called "The West Kelso Branch of the United Presbyterian Young Men's Mutual Improvement Society." And in the second place, though here in Guiana we have by use got reconciled to the fact that our Society, though calling itself an Agricultural and Commercial Society, has, whatever it ought to have, very little to do with agriculture and still less with commerce, yet the real nature of our Asso-

ciation is not accurately described to the outside world by its title; and it is obvious that if this Journal, which is to deal with scientific and literary, at least as much as with agricultural and commercial, subjects, is to obtain that wide circulation outside the colony which we desire, it must not handicap itself by taking as its title, at least as its first title, one that wrongly describes its contents. Then came the difficulty that no short truly descriptive title was obvious. This difficulty has been met, perhaps shirked somewhat ignobly, by taking a title which is convenient in its brevity and is at the same time not falsely descriptive, in that it is not descriptive at all. And yet this title which we have chosen is not without great appropriateness.

Timehri or *Timeneeri* is a Carib word, belonging to a language which was spoken in Guiana before any European tongue ever wagged here, signifying certain marks or figures which, like our letters and words, expressed ideas, which, to use a long word, were ideographic. On many of the rocks of Guiana these marks or Timehri, which were here so long before any European pen ever made mark on paper in Guiana that their engravers have been forgotten, still exist. As in Egypt the hieroglyphics, so in Guiana these Timehri stand as the records of a forgotten time, and the oldest to be found within our limits.

Perhaps we may be allowed to digress for a few minutes to show that the word Timehri has a curious scientific and etymological interest. Scientific men, when nothing more than scientific, are notoriously barbarous linguists. To mix a Greek with a Latin word into

a scientific word is as common a trick with them as it was with Humpty Dumpty when he puzzled Alice by using portmanteau words on the other side of the looking glass. And the consequence is that the etymologist is often distracted in his endeavours to trace the history of some scientific word. For instance, there is a well known tree in Guiana which scientific people all over the world call *Piratenera guianensis*; it is the tree from which our so-called "Letter Wood" is obtained. Piratenera is neither Latin nor Greek, belongs that is to say to neither of the two languages to which most scientific words may be traced. Pira or paira is the Carib name for the letter wood tree, the heart-wood of which, and the heart-wood only, has those letter-like markings which have given to it its colonial name. Paira timehri or Paira timineeri—that is, "marked paira"—is the Carib name for this particular heart-wood. Aublet, the botanist who found this tree in Guiana and named it, took its Carib name, paira timeehri, to make the scientific word piratenera, which looks externally sufficiently like a Latin word to make etymologists ponder over its origin.

So this word Timehri, the name of these old writings which are written on the rocks of Guiana, is the name which we have adopted for the writings which we propose to mark on the white paper of this Guiana journal.

Lastly, we cannot but thank our contributors for their unexpectedly numerous and valuable contributions, so many in number that some have necessarily been reserved for future use; and we are almost equally indebted to our publisher, who has so energetically entered on his share of the enterprize, that this, our first number, pro-

mises to be an example of the fact that, at least as regards paper, type, and general effect, a journal can be produced as effectively in this comparatively small colony of ours, as in the greater home-country across the water.

The Cultivation of Cocoa.

By Alexander H. Hensen of Pln. Leonora.

THE absence of small industries which might be successfully prosecuted here, is no doubt in a great measure attributable to the want of labour; and to quote the words of an authority:—

" However small the industry an individual may under-" take—unless such is within the compass of an individ-" ual,—when reaping time comes, recourse must be had " to some form of *secured labour*, and it is, because of " this important fact, that small industries have fallen " to pieces in British Guiana."

The steady increase in the consumption of chocolate in Europe and the United States of North America in late years, has, as a consequence, drawn the attention of planters in the West-Indies to the cultivation of cocoa. Knowing how well it pays in Trinidad and Surinam, I think that British Guiana, which takes the lead in, and gives the tone to the sugar industry, should also have its share of the profits to be derived from cocoa, especially as the two forms of cultivation may easily be combined.

A perusal of the charts of the colony shows that the up country was first settled by coffee and cocoa planters,—all of which lands are favorable for cocoa cultivation,—but for some cause or other these plantations were abandoned, possibly from want of la-

bour, coupled with the low price to which both coffee and cocoa fell in the markets of Europe. Now that remunerative prices rule for both products, it seems a fitting time for men of small capital to resume the cultivation of cocoa, as this industry may be profitably followed by a single family, thereby getting rid of all difficulty in harvesting the crop.

Having studied cocoa planting since 1875, my experience having been gained in Sumatra and, especially, in Surinam, I saw at the latter place that it is difficult to get sufficient creole labour. I understand that it is the same in this colony; up the rivers however, it would perhaps be possible to induce the squatters and Indians to work.

For the cultivation of cocoa, good clay soil and an ample supply of fresh water are necessary. It will also grow on sandy soil, though it will not live so long as on clay and is sooner destroyed by bad weather. Brackish land is unfit for cocoa, and salt water is its greatest enemy.

In Surinam the cocoa with yellow pods, called "creole cocoa," is generally planted. Another sort, with red pods, named "Caracas cocoa," is also at present planted by every one who can get the seeds. Where both are grown in the same field, the red degenerates before the creole. Planters there assert that the Caracas grows more quickly and strongly, that it bears more and better than the creole. The beans, however, are lighter than those of the creole variety, so that on an average the kernels of 10 to 12 creole fruits will yield one half kilogram (1.1 lbs.) of cocoa; while for the same quantity 14 to 16 fruits of Caracas are wanted. The Caracas has more spongy beans than the

creole; but the flavour of the former is superior.

Planting may be done in two ways; either by seedlings or by seeds.

In the first case, the fruits being opened on the day the seeds are to be planted, the beans are taken out, and put into a tub filled with fresh water. Those that float are removed, the remainder washed. To protect them from the attack of insects and further destroy the sweet pulp surrounding them, they are covered with wood-ash or lime. The latter is to be preferred as it acts more quickly. Sometimes seedbeds are formed; and when the plants are sufficiently large, they are dug up, put in small baskets, and transplanted to the desired place; an operation which requires care, for if the roots are injured, the plant dies. Sometimes single seeds are planted one inch deep, each in a small basket of good earth; in the dry season the seed is covered slightly; in wet weather it is left uncovered. In 7 or 8 months the plants are large enough to be planted, of course with basket and all.

In planting with seeds, the soil is made loose and fine to a depth of 4 to 5 inches; 3 holes are made at the angles of a triangle, 1½ foot apart; in each hole one seed is put, and according to the season left uncovered or slightly covered with earth.

The best time for transplanting is the rainy season, in May, June, December and January. When transplanting it is important to re-place the plants so that the morning sun falls upon them from the same direction as it did when they were in their former positions. This may easily be done by clipping two or three of the leaves on the side on which the morning sun strikes

before the plants are disturbed, and arranging the plants in the same way, in relation to the sun, when placing them in their new sites.

Training is begun as soon as the growth permits. Only three or four of the strongest branches are left, all weak ones removed. The ground should be covered as much as possible without allowing the trees to interfere with each other or excluding light and air.

The cocoa is apt to produce a great number of branches and branchlets, at the cost of its bearing powers, and care must be taken to remove those that are superfluous in time. The best time to prune the trees is September and October, though it may be done in March, or in the beginning of April.

The best trees are on one single stem ; they live longer, bear better, and are not split by heavy winds. When the trees are growing so high as to make it difficult to gather the crop it is necessary to prune.

The whole year through, but especially after pruning, all suckers—light coloured branches with soft bark—which spring from the trees must always be removed, the sooner the better, as they weaken the trees. Pruning should always be done from underneath, cutting as near the stem as possible, so that the wound can heal more easily. It happens sometimes that a tree being cleft or broken must be cut down. If possible, it must be cut at a small distance from the ground, so that it may sprout again ; the best and lowest sucker being retained, this will grow into a new tree. Trees often wither at the top—for instance when attacked by grubs—while lower down healthy suckers are sprouting; in this case the trees

must be treated in the way stated above. The precaution should however always be taken of planting a young tree near, to guard against any accident happening to the old stem.

Till their third year the plants must be well earthed up at the beginning of the dry season.

The field must be kept clean, especially at the end of the dry season, so as to allow the soil to have full benefit from the first rains. As a matter of course, the trees must always be free from parasites and creepers. Sometimes the bark is covered with a sort of moss, especially if the air has not free passage. This moss must be removed by brushing with cocoanut fibre, as it prevents those parts from blossoming. During the dry season the trees are generally visited by a grub which attacks the bark at several places, lays its eggs inside, and multiplies quickly. This is especially the case after the trees have been pruned. The bark must be carefully cut away where attacked, without injuring the tree, the worms and eggs removed and destroyed. If they have bored to the heart, the tree withers and dies. The danger is not so great in older trees as it is in those from 2 to 4 years old. The wood of the former being thicker and harder, the grub is detected and destroyed before so much injury is done. From 2 to 4 years the trees are so tender that they hardly bear even the cutting away of the injured bark.

Another plague is present in three sorts of ants—one makes large nests in the soil, gnaws the seeds when planted and eats away the young leaves, sometimes cutting the crown of the young plants, seriously damaging

and often killing them. As these ants pursue their harmful work throughout the year, every means must be taken to destroy them. This can be effectually done by ploughing up the nests till the bottom is reached and constantly pouring on water, stirring continuously until the whole is in a semi-fluid state. The ants cannot escape then, and this operation must be repeated till they are all destroyed. The second species which is not so dangerous, makes its nest between the branches of the tree, and by covering the bark often for a considerable space prevents the flowering and consequently the formation of fruit. The nests must be carefully removed and burned. Wood ants—the third variety—which also make their nests on the trees, are killed by scattering arsenic in the nest.

Cocoa blossoms throughout the year, except in September and October, but especially during November and the beginning of December. Cold nights dry up and harden the blossoms and young fruits on the trees. The ripe fruit is gathered more or less the whole year through; the chief crop, however, is plucked during the months of May, June and December. The pods are collected by cutting the stalk with a cutlass or, where the fruits cannot be reached, with a hook on a pole. The fruits are generally opened in the field with a cutlass, care being taken not to touch the beans; these are put in baskets; the empty shells are heaped in the middle of the beds and left there to rot, and serve as manure. It would perhaps be still better if these shells were buried, as is done with trash on sugar estates, instead of leaving them exposed to the rain, which washes down a great deal

of their fertilizing elements into the drains.

When forming a cocoa plantation, good drainage—necessary for almost every cultivation—and a sufficient supply of fresh water, are indispensable.

The land after being drained and cleared is divided into beds, say 30 feet wide. Two weeks before the rains set in, the land is planted with plantain suckers. The distance depends on the fertility of the soil and varies from eight to twelve feet. They must be planted sufficiently deep to prevent as much as possible their overthrow by heavy winds.

The plantain shelters and shades the young cocoa, keeps the soil cool, and helps to cover the expenses; bananas would serve the purpose of shelter still better, but they fetch almost no price in the market when offered in great quantities. Cocoa wants shade as long as it lives, and as the plantains gradually die and the cocoa trees become taller, another shade tree is required. It may be accepted as a rule that, sufficient shade good crops, no shade no crops. The tree used is *Erythrina umbrosa*, which not only shades the plant, but keeps the soil loose by its roots, and has the peculiarity of absorbing a great deal of water during the rainy season, which it returns during the dry season, thus keeping the soil moist.

After the plantains are in, young and thick suckers of Erythrina, 7 to 8 feet long, are planted at a distance of fifty to sixty feet apart in the centre of each bed, at a sufficient distance from the tracker, say 6 to 8 feet. As these trees generally sprout at the upper end, they must be planted sufficiently deep, say 2 feet, to avoid top-heaviness. The Erythrina may also be planted by seed, but as

it takes too long before they become trees, it is preferable to use suckers. This work done, a beginning is made with the cocoa.

Cocoa is generally planted from 14 to 25 feet apart. I think 16 to 18 feet is best. Sometimes—at least in Dutch Guiana—the trees are planted about 7½ to 8 feet apart, and the alternate trees are cut when the plantation is 6 to 7 years old. The upholders of this system say that they gain the crop, however small it may be, of 2 or 3 years, and that weeds are fewer owing to the closer planting. It is better to put the trees in their proper place at once; for if sufficient shade is provided, larger crops when the trees are full-grown will abundantly compensate for the extra weeding; and the trees, having had plenty of room to grow, are healthy, well developed and strong. The distance at which to plant having been determined, patches two feet in diameter are ploughed and pulverized where the trees will stand; the rows are lined 7 feet from the drains at each side of the 30 feet bed; and the centre is so lined that the rows of plants intersect the two outside rows at regular distances, forming figures in the form of a rhombus.

In this way, the trees have sufficient space to grow and develop. When planting is done from the nursery, a basket with a healthy plant is placed in the prepared spot. When seeds are planted, three small holes at the angles of a triangle are made in each of the ploughed circles, and a bean put into each hole; 5 to 6 inches from every seed, a cassava stick, 2 feet long, is planted vertically. This is done to give shade, and to show exactly the place where a bean is planted. In the rainy

season these cassava plants are pruned, the stem only being left to sprout when the dry season is at hand. The cassava is cut level with the ground when the cocoa is so large as to need all the ground. Some planters harvest the cassava, but experience teaches that this injures the tender roots of the cocoa and kills the plant.

Seeds which do not germinate must be replaced; so that fields must be provided with seed beds. It is best to have one or two seed beds at each side of the field and in the centre, for then the plants are close at hand when wanted, and much time and expense is saved. The seed beds selected, the beans are put into holes made with a hoe at a distance of 2 to 2½ feet apart between the plaintain and the permanent cocoa trees. It is always better to have seed beds, even in fields where the cocoa is fully grown. The young plants thrive very well in their shade.

Whenever a cocoa tree dies, a young plant must be put in its place during the rainy season. Many planters prefer always to set the seed in small baskets or in joints of bamboo; but this, of course, adds somewhat to the cost.

The trying period for the young cocoa is between the second and fourth years, when if there is not sufficient shade, many are killed by droughts. It is then that the importance of having a sufficient quantity of young plants close at hand to supply the field is seen.

When the plantation is established the planter has only to keep his fields in order to be sure of success.

No profit is to be expected during the first five years, though there are examples of planters having made a

handsome profit out of the plantains in the second year.

The cultivation fully grown, the expenses are trifling, and 70 per cent. of the gross produce is profit. The cocoa tree generally begins to bear in the fourth year, and is considered to attain maturity at the twelfth. The average yield is then 1½ kilogram (3.3 lbs.) per acre per annum.

Even when the trees are fully grown, it is always necessary to keep a vigilant eye on them, to prune them when necessary, to trace out and remove the causes why one field produces less than another; in a few words, to keep the cultivation bearing; for it often happens that by carelessness the plantation yields less and less, till at last it becomes totally fruitless. It must be the care of the planter to prevent this and make the trees yield as much as possible regularly and without exhaustion.

The cultivation of cocoa demands no great outlay of capital, and the profit is pretty certain.

The preparation of the nibs or beans for the market, involves no great labour; the first operation is fermentation, which gives a certain colour, develops the flavour and taste, and favours the drying process. The duration of this fermentation depends a great deal on the colour desired, and varies with the weather. Generally it is from 2 to 4 days. In Dutch Guiana the fermenting shed is a small closed building divided into compartments, generally three or four, each with a door in front. The plank floor is provided with holes throughout its length, in order to allow the cocoa juice to drain from the beans. This juice is often collected and used to manufacture a sort of vinegar of inferior quality.

The wet or fresh cocoa is passed into the first compartment, where it is left for 12 hours, is then transported to the second compartment (being turned at the same time), where it remains for 24 hours, and is then spread out on the "droogery" to dry. This "droogery" is a large tile pavement, higher in the centre than at the sides, to get rid of any water as soon as possible. The small grower, who has to deal with only a few baskets of beans, throws them into a trench in a dry place and covers them with green plantain leaves, in which position they soon ferment; after a little experience, the heat felt in plunging the arm into the mass, gives warning when the fermentation has proceeded far enough. The after process is exactly the same as on the large scale.

Generally the fermenting shed stands on one side of the pavement, the drying-store on the other; so that one passes directly from the store or the shed to the platform. The size depends on the acreage in cultivation. The first and second day, the cocoa is allowed to remain in the sun only till noon, when it is brought into the store and put in heaps. It ferments again slightly with the result of making the beans more uniformly round; a few hours after having been brought into the store, the heap is turned, to prevent too strong fermentation, and left till next morning. On the 3rd and 4th day the cocoa is exposed nine hours to the sun; it is then spread out in the drying store and left there from 5 to 8 days, being turned daily. This must not be neglected, for unless the cocoa is quite dry and cool when packed it becomes mouldy. The cocoa is now cured, and ready to be put in bags for shipment. The fermentation of the crops

terminated, the shed must be thoroughly cleaned and aired. It is advisable to fan the cocoa with a winnowing mill, before packing.

As the principal part of the crop is gathered in the rainy season, drying is often difficult; carrying in when it is cloudy, and carrying out when it clears, is expensive, and much time is lost. It would be therefore better if a platfrom, some feet from the ground, with a movable roof, could be used, as is usual on large plantations in Trinidad and Caracas, where things are done on a large scale. Now that glass roofs are so inexpensive, I understand that drying sheds with glass roofs are being extensively used to relieve the planter of the principal difficulty in preparing his crop.

Estimated Cost of Cocoa Cultivation.

A COCOA PLANTATION TAKEN FROM THE FOREST, 100 ROODS FACADE BY 750 ROODS DEPTH, 250 ACRES.

Purchase of land and expenditure on making public roads and two bridges		$ 1,000 0
Underbushing, cutting, clearing and burning, at $13 50 per acre		3,375 0
EMPOLDERING AND CANALS.		
Two side lines (one navigable) each 750 rods = 1,500 rods, at $1 50	$ 2,250 0	
Back dam, 100 rods at $4...	400 0	
Front dam, 100 rods at $4	400 0	
Sluice	1,000 0	
Digging 250 drains at $8 per drain	2,000 0	
Digging 750 rods tracker at 50 cents... ...	375 0	
		6,425 0
Carried forward		$ 10,800 0

Brought forward		$ 10,800 0
BUILDINGS.		
Dwelling house for proprietor or manager ...	$ 3,000 0	
Dwelling house for overseer	750 0	
Houses for 50 labourers, at $70 each... ...	3,500 0	
Hospital	1,000 0	
Drying shed with rolling roof	1,000 0	
Trays and fittings	200 0	
Fermenting chamber of brick	400 0	
Droogerie 50 feet x 30	300 0	
		10,150 0
PLANTAIN CULTIVATION EXPENSES.		
Purchase of 211,750 plantain suckers at 2 cents...	$ 4,835 0	
Loading and transporting	381 15	
Planting suckers, each bed 7 rows parallel to small drains, at 10 feet distance = 211,750 suckers at 70 cents per 100	1,482 25	
		6,098 40
COCOA CULTIVATION EXPENSES.		
Cutting 8,000 Erythrina suckers, 8 feet in length, at 40 cents per 100	$ 32 0	
Transporting	5 12	
Planting Erythrina suckers, 2 feet deep, one row in the centre of each bed, at 45 feet distance; 28 x 250 = 7,000 suckers at $1 20 per 100 ...	84 0	
Cutting cassava suckers, 250 bundles at 12 cents...	30 0	
* Ploughing: 244 circles per acre (20 feet distance, 4 rows parallel to small drains) = 61,000 circles at 40 cents per 100	244 0	
Planting cocoa beans with the requisite cassava sticks, at 28 cents per acre	70 0	
		465 12
SUPPLYING AND WEEDING.		
Purchase of 70,600 plantain suckers at 2 cts. each..	$ 1,412 0	
Transporting	141 0	
Planting 70,600 suckers at 70 cents per 100 ...	494 20	
Cleaning trenches	60 0	
Weeding young cocoa and supplying with beans, at 28 cents per acre = $70 for 250 acres, 4 times per year	280 0	
Weeding 250 acres of plantains at $1 52 per acre, 5 times	1,900 0	
		4,287 20
Carried forward		$ 31,800 72

* In this estimate the beds are reckoned as of the usual width, viz., 37 feet instead of 30 as stated in the essay. They can therefore be planted with four rows of cocoa at a distance of 20 feet instead of three rows at 16 feet. The beds being wider, the shade trees must be put closer—45 feet.

Brought forward		$ 31,800 72
Incidental expenses		250 0
SALARIES.		
Manager s or proprietor's	$ 2,000 0	
Overseer's, including finding	600 0	
		2,600 0
		$ 34,650 72

Second Year.

Cutting and transporting 141,200 bunches of plantains, at 40 cents per 100	$ 564 80	
Cutting plantain trees and moulding... ...	282 40	
Supplying with 70,600 suckers at 64 cents per 100	451 84	
Weeding young cocoa and supplying with beans, 4 times	280 0	
Weeding 250 acres of plantains at $2 04 per acre, 4 times	2,040 0	
Making 50 nursery beds at 48 cents per bed ...	24 0	
Cleaning trenches	60 0	
Eight watchmen, at $84 per year	672 0	
		$ 4,375 04
Eight watch-houses at $70		560 0
Incidental expenses		250 0
Salary of manager	$ 2,000 0	
" of overseer	600 0	
		2,600 0
		$ 7,785 04

ESTIMATED RETURN.

Sale of 141,200 bunches of plantains at 16 cents = ...		$ 22,592 0

Third Year.

Cutting and transporting 105,875 bunches of plantains, at 40 cents per 100	$ 423 50	
Cutting plantain trees and moulding ...	211 75	
Weeding cocoa at 28 cents per acre, 4 times ...	280 0	
Weeding 250 acres of plantains, at $2 04 per acre, 4 times	2,040 0	
Training young cocoanut trees, 100 men, at 32 cents, twice	32 0	
Carried forward	$ 2,987 25	

Brought forward ... ...$	2,987 25	
Supplying with cocoa plants, 100 men, at 32 cents, twice...	64 0	
Cleaning trenches	60 0	
		3,111 25
Digging side line trenches, 1,500 rods, at 40 cents.$	600 0	
Digging drains, 250, at $2 per drain	500 0	
Digging trackers, 750 rods, at 4 cents per rod ...	30 0	
		1,130 0
Eight watchmen, at $84 per year ... ...$	672 0	
Salary of manager	2,000 0	
„ of overseer	600 0	
		3,272 0
Incidental expenses		250 0
		$ 7,763 25

ESTIMATED RETURN.

Sale of 105,875 bunches of plantains, at 16 cents each = ...	$ 16,940 0

Fourth Year.

Cutting and transporting 36,000 bunches of plantains ... ...$	144 0	
Cutting plantain trees and moulding ...	72 0	
Weeding cocoa at 28 cents per acre, 4 times ...	280 0	
Weeding the field at $1 52 per acre, 3 times ...	1,520 0	
Cleaning and training cocoa trees, at 24 cents per acre, 3 times	180 0	
Supplying with cocoa plants, 100 men, at 32 cents, twice	64 0	
Cleaning trenches	60 0	
		2,320 0
Eight watchmen, at $84 per year ... ...$	672 0	
Salary of manager	2,000 0	
„ of overseer	600 0	
		3,272 0
Incidental expenses		250 0
		$ 5,842 0

ESTIMATED RETURN.

Sale of 36,000 bunches of plantains, at 10 cents each = ...	$ 3,600 0

Fifth Year.

Weeding the field, at $1 52 per acre, 4 times ...	$	1,520		
Cleaning cocoa trees at 40c. per acre, 4 times ..		400		
Cleaning trenches		60		
			1,980	0
Four watchmen at $84 per year	$	336		
Salary of manager		2,000		
„ of overseer		600		
			2,936	0
Incidental expenses			250	0
			$ 5,166	0

Sixth Year

Expenses of cultivation as during the 5th year ..			$ 5,166	0
Digging side line trenches, 1,500 rods at 40c. ...	$	600		
Digging 250 drains at $2		500		
Digging 750 rods trackers at 4c.		30		
			1,130	0
			$ 6,296	0

Seventh Year

Cleaning cocoa trees at 40c. per acre, 4 times ..	$	400		
Weeding the field at $1 52 per acre, 3 times ..		1,140		
Cleaning trenches		60		
			1,600	0
Four watchmen at $84 per year	$	336		
Salary of manager		2,000		
„ of overseer		600		
			2,936	0
Incidental expenses			250	0
			$ 4,786	0
Gathering and curing the crop, 9,500 kilogrammes (14,300 lbs.) of cocoa at 24c. per 10 kilogrammes (22 lbs.)—			$ 1,560	0

ESTIMATED RETURN.

Sale of 6,500 kilogrammes (14,300 lbs.) at 24 cents per kilogramme (2.2 lbs.)=	$ 1,560	0

Eighth Year.

Expenses of cultivation the same as during the 7th year	$ 4,786	0
Gathering and curing the crop, 26,250 kilogrammes		
Carried forward	$ 4,786	0

Brought forward		$ 4,786	0
of cocoa (57,750 lbs.) at 24c. per 10 kilogrammes (22 lbs.)		630	0
		$ 5,416	0

ESTIMATED RETURN.

Sale of 26,250 kilogrammes (57,750 lbs.) of cocoa, at 24 cents per kilogramme	$ 6,300	0

Ninth Year.

Expenses of cultivation the same as during the 8th year	4,786	0
Gathering and curing of 40,000 kilogrammes (88,000 lbs.) of cocoa, at 24 cents per 10 kilogrammes (22 lbs)	960	0
	$ 5,746	0

ESTIMATED RETURN.

Sale of 40,000 kilogrammes (88,000 lbs.) of cocoa, at 24 cents per kilogramme (2.2 lbs.) = ...	$ 9,600	0

Tenth Year.

Expenses of cultivation the same as during the 9th year			4,786	0
Digging side line trenches, 750 x 2 rods, at 40 cts.	600	0		
Digging 250 drains, at $2 per drain	500	0		
Digging 750 rods trackers, at 4 cents ...	30	0		
			1,130	0
Gathering and curing 65,750 kilogrammes (144,650 lbs.) at 20 cents per 10 kilogrammes (22 lbs)			1,315	0
			$ 7,231	0

ESTIMATED RETURN.

Sale of 6,750 kilogrammes (144,650 lbs.) of cocoa, at 24 cents per kilogramme (2.2 lbs.) = ...	$ 15,780	0

Eleventh Year.

Expenses of cultivation the same as during the 10th year	$ 4,786	0
Carried forward	$ 4,786	0

Brought forward	$ 4,786 0
Gathering and curing 75,000 kilogrammes (165,000 lbs.) at 20 cents per 10 kilogramme (22 lbs.) ...	1,500 0
	$ 6,286 0

ESTIMATED RETURN.

Sale of 75,000 kilogrammes (165,000 lbs.) at 24 cents per kilogramme (2.2 lbs.) = ...	$ 18,000 0

Twelfth Year.

Expenses of cultivation the same as during the 11th year	$ 4,786 0
Gathering and curing of 90,000 kilogrammes (198,000 lbs.) at 20 cents per 10 kilogrammes (22 lbs.)	1,800 0
	$ 6,586 0

ESTIMATED RETURN.

Sale of 90,000 kilogrammes (198,000 lbs.) at 24 cents per kilogramme (2.2 lbs.) = ...	$ 21,600 0

RECAPITULATION.

Expenditure.		*Revenue.*
$ 34,650 72	1st year	Nil
7,785 04	2nd „	$ 22,592 0
7,763 25	3rd „	16,940 0
5,842 0	4th „	3,600 0
5,166 0	5th „	Nil
6,296 0	6th „	Nil
4,942 0	7th „	1,560 0
5,416 0	8th „	6,300 0
5,746 0	9th „	9,600 0
7,231 0	10th „	15,780 0
6,286 0	11th „	18,000 0
6,586 0	12th „	21,600 0
$103,710 01	... ...	$115,972 0
	Deduct	103,710 01
	Leaving	$ 12,261 99

to the good in 12 years, with the estate clear, and with a probable net revenue yearly of $15,014—or 69·5 per cent. of the gross produce.

ALEX. H. HENSEN.

Tame animals among the Red Men of America.

By the Editor.

THE American Indian finds means to tame almost every wild bird and beast of his country; so that these domesticated animals are ever among the most prominent members of his household. All who have travelled among the Red skins of South America have mentioned this fact; and many have supposed that it indicates an affection in these people for animals.

That the Indians have no affection for animals is shown by the fact that if the birds or animals are once assigned to new owners, but left for a time in charge of the former owner, the latter if he gets a chance, often neglects, or even treats them with cruelty. Indeed Indians are sometimes guilty of the most atrocious and wanton cruelty to animals. In one place, I saw two nests of young "mocking birds" *(Cassicus persicus)* brought in by some children. The first day, food being abundant, some was given to the birds; but on the second day, scarcity prevailing, some of the poor little nestlings were given by full grown men to the puppies to worry, and the others were held in their nest over a hot fire. My remonstrances stopped the proceedings, but I was laughed at. Soon after a woman lying back in her hammock laughingly pulled a large hawk-moth (*Sphinx sp?)* to pieces, singing to it all the time. Again, still on the

same day, a young fellow in a spirit of pure merriment held a gigantic grasshopper by the wings with its head towards him and chopped pieces off its tail with his knife, to make it whirr. Such is the record of cruelties practised by the Indians of a single settlement in a single day. On the other hand, they are careful not to hurt any animal which they may be able to sell or barter. But they are entirely without kindly feelings towards animals; and, indeed, they seem to be curiously unsympathetic toward pain, not only to that of other animals but also of their own fellows, and even of their nearest relations.

It is, therefore, a fallacy to suppose that Indians, at least those of Guiana, feel any natural affection for animals. As a matter of fact an Indian appears almost incapable of such a feeling. But he has good reasons for increasing and taking care of his live-stock. In the first place he probably feels a certain child-like pleasure in the bright colours of many of the birds; and just as he hangs their feathers, and sometimes their entire skins about his body, by way of ornament, so he likes to see plenty of them living in and about his house. But his chief value for his live-stock is that he regards this as so much coin with which to purchase what he wants from other Indians. He keeps some of the birds, too, for the express purpose of supplying him with the feathers of which he makes many of his body ornaments; just as English fishing-tackle makers keep macaws, and perhaps other birds, to supply a feather or two when these are wanted for fly-making.

According to the rude system of division of labour

and exchange of products which prevails among these people, the Indian, instead of always paying for the goods which he takes from other Indians with those which he has himself made, often pays away his tame animals, which, like the precious metals in more civilized communities, have a conventional value, partly dependant on their rarity, far beyond their practical value. Now-a-days, however, their value, as though the animals were really bank-notes, is often realised in cash; for, being passed from one Indian to another, eventually they often reach the coast, and are there exchanged for the real money and rum of white men and black.

But there is yet another reason for the value of these tamed animals. Certain of the birds, are prized for their feathers, which are used in making the head dresses, ruffles, tassels and other ornaments which are worn on festive occasions. In making some of these ornaments, each tribe uses only feathers of one or more particular colours or shades cf colour, so that each tribe is distinguished by the colour of its ornaments. Some Indians on the Rio Negro, though none of those actually in British Guiana, occasionally also ornament their hammocks with feathers arranged in most elaborate and beautiful patterns. Many of the feathers used for these purposes are of forms and colours not at all times readily obtainable from wild birds. For instance, one very common form of feather crown is invariably lined with long white downy feathers; and again, for certain of the ornaments, feathers of a peculiar and very rare shade of yellow are used in large quantities. To supply the former of these wants, Indians now keep large number of barn-door fowls, gener-

ally of a pure white breed. As under no circumstance do they eat fowls or their eggs, it was puzzling to account for this habit of keeping fowls apparently for no purpose, until it appeared that the real use of these birds is to provide the white downy feathers spoken of above. To supply the yellow feathers, Indians keep large quantities of green parrots and red macaws. In looking at Indian parrots, not intended for barter, one notices that many of them have exchanged much of their original green plumage for yellow. Some are only speckled with yellow, others have one or both wings entirely yellow, and others, though such cases are rare, are yellow all over. Yet these birds are of species which when in a state of nature have not a single yellow feather about them, or at most only a few on the crown of the head. The Redman knows how to change the colour of the feathers of any individual bird from green to yellow. One Indian gave me the following quaint account of the process. Some of the natural feathers are pulled out, and the place from which they were torn is rubbed with faroah, the red dye procured from *Bixa Orelana* with which the Indians paint their own bodies. The bird is also made to drink water in which more faroah has been steeped, after which it is left for some months. During this time the owner himself eats very sparingly, and chiefly of certain kinds of food. At the end of the time new yellow feathers have grown in the place of the abstracted green ones. Probably the pulling out of the original feathers, together with the great quantity of fish which these birds pick up and eat in their wanderings about the huts of their owners has something to do with the

change in colour. At any rate, there is no doubt that the yellow feathers are obtained from these birds by some kind of artificial treatment.

One of the first occasions on which I saw many tame animals in an Indian settlement was at a place called Apooterie, inhabited by the various members of a family of true Carib Indians, at the junction of the Rupununi and Essequibo Rivers. There were more than a dozen parrots of various kinds, two macaws, two trumpet-birds *(Psophia crepitans)*, two troupials *(Icterus jamacii)*, several monkeys, a toucan, some powis or curassow birds *(Crax alector)*, a sun-bird *(Eurypyga helias,)* and many others. And this was not a very unusual number for one settlement.

The sun-bird interested me most. Of all English birds, it perhaps most resembles a snipe, only that it is much larger and much more slightly and gracefully built. Its colour is, I fear, indescribable. The general colour is a dark brown, but this is so exquisitely, delicately, and intricately banded, barred and spotted with other shades of brown, with yellow, white, black, and gray, and with orange-red, that the whole effect is a beautiful harmony of soft tints. It has a habit of gracefully spreading its large tail and wings to their fullest extent so as almost to hide its body under their cover. A skin of the dead bird as we see it at home gives no idea of its beauty; but the living bird is so beautiful in colour, and graceful in form and motion, that it well deserves the name of sun-bird.

All day long it moves about in a very slow and stately way, at an even regular pace. Every now and then,

slowly raising its bill, it utters a clear bell-like note, but so low that at first it is almost impossible to discover where the strange sound comes from. Then, if it sees a fly settle near the ground, it very gradually and quietly approaches the victim, slowly lowers the point of its bill till it is near the fly, and suddenly, with an odd clicking sound, and with one rapid little jerk of the head the fly is seized and swallowed. Then the slow, well regulated behaviour is resumed. Every motion seems regulated by clock work. The stateliness, the dignified carriage of the tail and wings, and the rich and subdued beauty of colouring of the feathers reminded me somehow of a certain little, quiet, stately old lady in a stiff full dress of older brocade.

The bird is easily tamed, and is highly valued in the civilized parts of the colony because of the number of flies and other small insects—the true tropical beasts of prey—which it destroys.

Tame trumpet birds (*Psophia crepitans*), too, are both amusing and beautiful. The long feathers of a soft gray colour, overlying the back in curiously graceful rounded masses, contrast beautifully with the short black feathers, touched with glittering purple, of the chest and neck. The strangely deep and full note, uttered singly, with a pause between each two, is very striking; and because of its supposed likeness to the sound of a trumpet has given a name to the bird. They are among the commonest tame animals in Indian houses, and they follow their masters about even to some distance from home, like dogs. During these walks, as if in an exuberance of good spirits, they every now and

then spring some three feet, turning a somersault as they descend. Often too they run up to their masters and offer their heads to be stroked. One of these birds which belonged to a missionary in the colony, used to annoy its master by walking solemnly in front of him when, in conducting a funeral service, he passed from the church to the open grave, and there the bird would stand still, looking down into the cavity and uttering its odd note.

These birds are very bold, so that when they live together with domestic fowls they domineer over even the most autocratic cock. At first the cock may fight, but the trumpet-bird puzzles and defeats its enemy by leaping up into the air and coming down with great force on its opponent's back, making full use of its unusually powerful claws.

But, after parrots, the commonest of all these tame animals is the curassow-bird, called powis by the Indians—*Crax alector* of scientific men. It is nearly as large as, and in shape not unlike, a turkey. All its feathers are of a deep glossy black, except that in young birds and in females, each of the short curiously curled feathers which form the crest on the top of the head has a white streak along its shaft, so that when the crest is stroked there is a gleam of white from under the black. Beak and legs are of the brightest yellow. They too exercise dominion over cocks and hens, and even sometimes try to extend their authority farther; for I have seen them attack young children when playing in the dust, striking them with their wings and feet. As a rule, however, they are very tame and gentle with their human friends. In a wild state they are very abundant and are most excellent

eating. Being very readily tamed, and being sufficiently hardy to live in cold climates, attempts have naturally been made to domesticate them here and in England. It is said that they have been successfully bred in Holland; unfortunately, however, the domesticated birds, though they live and flourish, rarely breed.

There are always at least a few, and often a very great many, parrots about. There are some thirty species of the parrot kind wild in Guiana, nearly all of which are more or less frequently tamed. The favourites, however, are certain green kinds *(Chrysotis ochrocephala, C. festiva* and *C. æstiva),* a pretty yellow and black kind *(Caica melanocephala)* called kurua-kurua by the Indians, of all parrots the cleverest at learning tricks, and a most beautiful bird of a general purple colour shaded into red (*Pionus purpureus.*) Another striking kind is the hia-hia *(Deroptyus accipitrinus)*, called sun parrot in England. By the way, most of the Indian names for the various kinds of parrots are, as in the case of kurua-kurua and hia-hia, attempts to represent the natural cries of the birds. The body feathers of the hia-hia are of deep bright green, deeper and brighter than is usual among parrots, and its head is quite covered by a crest of long blue, red and grey feathers. When angry or in any other way excited, it raises the feathers of this crest till they stand erect round the head, like a large bright-coloured nimbus, or perhaps it may better be compared to the circle of the peacock's tail. All these parrots fly freely about the huts, feeding on the refuse strewn around, and coming at regular intervals to take the food specially placed for them. They are generally quiet enough, but just before

night, or just before rain falls, they raise a most horrid chorus of cries. Often though the sky was clear and unthreatening I have been prepared for the approach of a tropical shower by this bird chorus. The value of a parrot in Indian economics is generally very slight, but a single individual of one species, called towa-towa (*Chrysotis sp.*), is often offered and accepted in exchange for a large canoe, a gun, or a tamed hunting dog, the three most coveted articles among the ordinary properties of an Indian.

Macaws, ungainly in shape and gaudy in colour as they appear in Engand when chained by one foot to a perch, are really startlingly beautiful when wandering, tame but free, among the bushes and low trees round an Indian settlement. Under such circumstances, their colour, intensified by the bright tropical sun, produces as vivid an effect as is anywhere to be seen even in the animal kingdom. These birds, like most other animals, have an accurate sense of time, wandering away during the day from the villages, but returning regularly to be fed at a definite time in the afternoon. Macaws, though not great talkers, not infrequently pick up a few Indian words. It has already been said that they are sometimes kept by Indians for the sake of the yellow feathers which they can be made to produce; it may be added that the long tail feathers, in their natural colours, are also harvested from the living birds to be made into shoulder ruffs for their masters.

But of all the members of the parrot family to be met with in Indian settlement, by far the most beautiful are the lovely little keatzi or kessi-kessi (*Conurus solstitia-*

lis). These are long-tailed parroquets, with a little green in the tail and wings, but elsewhere covered with a bright yellow all over, except for a shading of deep red about the head. Their colour may be most accurately represented by saying that it is exactly like that of a ripe sun-reddened apricot. In a wild state they live only far from the sea-coast, chiefly among the Pacaraima mountains, where they are very abundant. It is therefore chiefly in the settlements of the Arecuna Indians, who live in and about those mountains, that these birds are tamed. They seem to be especial favourites with the Indians, probably because of their bright and unusual colour. Sometimes as many as twenty or thirty belong to a single house. The whole of this flock returns of its own accord to pass the night generally in a big goobie—the shell of a gourd the contents of which have been removed. Near the foot of the Pacaraima range some Indians one day brought me two goobies, one containing twenty, the other seven keatzi. A more beautiful and interesting sight than the twenty-seven little fellows running in and about the house I never saw. Though the two sets associated freely during the day, yet at night they always separated, each of its own accord returning to its own goobie, the one being put out at night on one side of the house, the other on the other. If by mistake the goobies were not put ready for the birds in time, then there was a riot; the two parties used to come up to the house and inflict the most horrible chattering and scolding; and the same thing used to happen regularly at midday and evening if their food had been accidentally withheld.

Each party had a leader, who always went first, whether it was to food or to bed. And the combined flock had a whipper-in, a queer little fellow who, because of the worn and stunted condition of his tail feathers, got the name of "Draggle-tail." If the flock was at some distance from home when food was put down or when the goobies were ready for the birds, and some of the party came, the others were slow to tear themselves away from whatever they happened to be doing, then Draggle-tail's, exertions were most arduous. He used to run from one to the other of the scattered truants, scolding and pushing them until they came home; nor would he ever take food or go to roost himself until he had collected and brought home the rest. The end of the poor Draggle-tail was sad; for he was seized, killed and eaten by a horrible tame monkey which frequently devoured the other tame animals, until, matters coming to a head one day not long after Draggle-tail's murder, the monkey seized a hen as big as itself, began plucking it, and was preparing to bite off its head, when the cries of the bird brought assistance, and the monkey was finally banished.

Monkeys are very abundant in some settlements. In one I counted as many as 21 of various kinds. They, too, are generally loose, and often follow the women like dogs when they go through the forest to their distant fields, or elsewhere. The monkey most characteristic of Guiana, is the "baboon" of colonists, the red-howler *(Mycetes seniculus)* of English naturalists, the *erota* of the Carib Indians. The very extraordinary noise made by this animal is much rather a roar than a howl; so that red-roarer would be a more appropriate name. In captivity this

monkey never seems to reach maturity among the Indians. When young they make a most amusing baby-like imitation of the roar peculiar to their kind.

The most usual tame monkeys are "sakawinkis" *(Chrysothrix sciureus)* and "quartas" *(Ateles paniscus.)* Another kind sometimes seen is the hurua *(Pithecia sp.?)* which in face bears so strong a resemblance to an old negro, that a young negro who was with me, after gazing intently into the face of one of these animals for some minutes, ended by ejaculating so emphatically that it seemed as if only irresistible truth forced the confession, 'Ei; but he favour black man too much.'

Deer of two sorts *(C. savannarum* and *C. humilis)* are sometimes tamed. One of the former kind made great friends with me, so that when I was sitting on the ground, it used to climb up and stand with all four legs gathered together on one of my shoulders. And it never missed an opportunity of emptying my tobacco pouch, pushing it open with its nose and eating the contents. Bush-hogs or peccaries *(Dicotyles labiatus* and *D. torquatus*) also become very tame—too much so sometimes, for they follow their master wherever he goes and sometimes even insist upon getting into his hammock. Coatis, locally called quashies, and by the Indians kibihees, (*Nasua solitaris* and *N. socialis*) play about with the dogs. These coatis after they have been long domesticated, seem very frequently to become blind. And, to make an end of the list of tame animals, jaguars and others of the cat species, tapirs, labbas (*Coelogenys paca*), water-haas (*Hydrochoerus capybara*), acouries and adouries (*Dasyprocta aguti* and *D. achuchi*)

may more or less frequently be seen among Indians.

A few other birds are worthy of mention. Vicissi ducks (*Anas autumnalis*), which get their Indian name from the whistling noise *vicissi-vicissi* which they make when flying, are among the prettiest; two of these with which I made friends, afterwards killed themselves by drinking cassava water—the poisonous juice squeezed out of the cassava root in the process of preparing it as wholesome food. This is not an unusual fate for Indian animals. Tame bill-birds or toucans, with their enormous and gaudy beaks, are most comical objects, but they can give a very sharp bite if handled too freely. They think nothing of attacking and putting dogs to flight. Troupials, the moramoroota of Indians, (*Icterus jamacaii*), starling-like birds, black and reddish orange in colour, are highly valued. One of these after annoying me for some time afterward did me good service. It was, as all its kind are, a most inquisitive bird, hopping about the roof and pecking at everything that came into its way. Occasionally, at the most unexpected moments, a shower of arrows or of some other objects, dislodged by the bird, came down on my head. It was also wonderfully skilful in pecking one's hands, often darting its needle-pointed beak hard in between the finger nails and the finger and drawing blood, till I believe it acquired a regular taste for that food. It was in the habit of going to a basket of cassava bread to pick off crumbs for itself. This basket, lined and covered with leaves, stood on the floor of the house, which was built on piles. One day the moramoroota hopped cheerfully as usual up to the basket and darted its head in among the leaves. The

next instant there was a change ; it gave almost a scream, started back, and literally fell, without using its wings, through a hole in the floor to the ground below. It seemed as if it had a fit. But it soon picked itself up and flew up near, but not too near the basket, round and round which it moved excitedly and angrily. On going to the basket to see what was the matter, a large rattle snake glided out.

The most curious of all Guiana birds, is occasionally, but very rarely tamed. This is the bell-bird (*Chasmarhynchus carunculatus*) a white bird, at least as regards the male, with an odd black process on the upper mandible, pendent ordinarily, but raised like a black horn when the bird utters its cry. And this cry, which is supposed to resemble the sound of a bell, has given a name to the bird. When domesticated the loud resonant cry uttered at intervals of about a minute throughout the greater part of the day is anything but pleasant.

Hawks, owls, herons, plovers and almost every other kind of native bird, are tamed ; but of these we cannot allow ourselves space to speak. Only one other bird must be mentioned, the beautiful cock-of-the-rock, (*Rupicola crocea*), of the most indescribably vivid fiery orange everywhere but at the tips of the wings and the tail where there is some black. Beautiful in colour as are the skins of these birds when seen in museums at home, no one can form an idea of the intense light of their colour who has not seen them living and in good condition ; for the life of the colour—if we may so speak—soon dies out after death or even when the bird is in bad health. These birds are highly valued by the Indians,

both for the sake of the large price which they fetch when carried to town and for the sake of the feathers which are largely used in some ornaments. To see a group of ten or twenty of these birds tame and in good condition is a sight to be long remembered. It is a curious fact that these birds, at least in captivity, are partly carniverous. I once saw one pounce down on a mouse which happened to pass under it, killing it and swallowing it whole. At the time I supposed that this was an abnormal and unusual occurrence; but I have since seen it repeated several times, and have even seen a tame cock-of-the-rock catch, kill and swallow small birds.

Snakes, as far as I know, are never kept alive by Indians; but some other reptiles are, for instance iguanas, (*Iguana tuberculata*). These lizards, ugly and dull-coloured when old, are of a most beautiful and vivid emerald green when young. They are evidently pleasing to the taste of the Indians, who undoubtedly have a childlike love and affection of bright colours.

It may be asked how the Indians obtain such numbers of animals and what means they employ to tame them. Many of the birds are taken when quite young from their nests, and many of the animals are caught at a corresponding age. But it is not only *young* birds and animals that are tamed. Many are shot with special arrows poisoned with just sufficient ourali (curare) to bring the animal down without actually killing it. The animal is then picked up, its face is rubbed with faroah—the red pigment used by the Indians for their own bodies,—in order to show the poor victim that its captors are 'good

people and kind,' and it is then put under an inverted pot or in some other dark and secluded place, and is there left without food or care for a day or two. If it survives this treatment, it is taken out and it is then generally docile and ready to eat the food given to it. Monkeys, especially marmozets (*Midas rufimanus*), are sometimes caught in a much more simple way. If a number of them are seen by an Indian feeding on a small isolated tree, he shakes the trunk violently until one or two of the animals are thrown to the ground. The Indians thereupon chase and run down the fallen ones, and seize and hold them, though often at the cost of a severe bite or two. Even old animals caught in this way become comparatively tame in three or four days.

It is the duty of the Indian women to feed the live stock belonging to the settlement. At intervals during the day they bring out many quakes, or baskets, from which they release crying and half-fledged birds or young animals. These are fed with cassava bread chewed by the women. Among some tribes, especially the Warraus, the women suckle the young mammals as they would their own children. Sometimes the birds are so young that it seems almost impossible that they can be reared by hand. Sometimes, especially in the case of parrots, the feathers do not seem to grow so soon under these unnatural circumstances as they would in nature. A nearly full-grown parrot may sometimes be seen without a feather or even a piece of down on its body, and in this state is as odd-looking a fowl as can well be seen. But it is very seldom that the women fail to rear the young stock. Even humming birds, taken a few days after they

are hatched, these women sometimes manage to keep alive until they are fully fledged, though never for long after that.

It has been said that, except perhaps in very rare cases, Indians have no real affection for their animals; but, on the other hand, the animals display great affection for the Indians. And in nearly all cases through these animals are not shy of even strange Indians yet they are most timid or angry if any white man approaches them.

This was perhaps most strikingly illustrated to me by a big black spider monkey (*Ateles beelzebub*) belonging to a settlement where I stayed some days. The animal could not bear to see me or either of my white-skinned companions looking at her. It frequently sat on the top of a big post in the middle of the settlement and watched us eagerly when it thought we were not looking; but if one of us gave any sign of looking toward her, were we far from it or near to it, it immediately put its head under its arm and cowered down on the post. Whether this objection is to the clothes of white men or to the colour of their skin I am not quite sure, but I think it is to the latter; for though the animals are not altogether friendly to negroes yet they are not so hostile to them —though negroes at the present day of course wear almost as much clothing as travellers in the bush—as they are to white men.

When Indians travel, leaving their homes entirely for a time, they take all their animals with them, either loose or packed in quakes or baskets. It is amusing to see a party of travelling Indians camping for the night at the side of the river. One of the first duties is to set free and

feed the various animals. The parrots and monkeys are turned into the trees; the other animals are released from their cages; and any water birds which may happen to be of the party are thrown into the water to enjoy a swim. Yet next morning the animals are all ready, as soon as are their masters, to be packed into the canoes and start once more on the journey.

Of course many dogs are included in the live stock of every Indian settlement, though no mention of them has been made in the preceding pages. Cats, except in very rare cases among the Arawack Indians, who are half-civilised and live much among white men and black, are unknown. And of other animals such as are commonly seen domesticated among us, Indians have none. Once, when travelling with a party of Guiana Indians on certain cattle farm's in Brazilian territory, I was much amused by their behaviour at first sight of horses, cows, pigs and turkeys.

It has been said that eventually many of the Indians' animals are brought down into civilized regions and disposed of to white men. Travelling Indians generally arrive in Georgetown in their canoes, having come down some one of the rivers and then coasted along the shore until they reached the mouth of the Demerara River, on which Georgetown stands. A considerable export trade in tame animals is carried on, chiefly by the Portuguese shopkeepers, from Georgetown to Europe and North America. As soon as a canoe load of Indians with their live stock is seen approaching the mouth of the river, rival Portuguese dealers put off in boats to meet them and bargain against each other for the whole stock of birds and ani-

mals, which is often thus disposed of before the Indian canoes touch the land. The new Portuguese owners then again dispose of the stock to the captains and mates of the many vessels which lie in the harbour loading produce for Europe or the States. Of course summer is a more favourable time for this trade than winter; so that, for instance, while the Portuguese will give perhaps as much as four shillings a piece for ordinary green parrots in summer, they will not give more than a quarter of that sum in the winter. Carried to England the same birds fetch from ten to twenty shillings in the shops of the retail dealers. If the birds when shut up in cages in their English homes could speak they could tell odd stories of their early life spent, half free, among red-skinned Indians. As a child sitting before the family parrot, I used often to wonder what sort of places it came from, and what were the surroundings of its early life. Afterwards I saw these things for myself.

A Journey in search of "Hevea Spruceana;" with Remarks on India Rubber and Gutta Percha yielding plants generally.

By G. S. Jenman, F.L.S., Government Botanist of British Guiana.

A SHORT time ago, the Governor of Trinidad having made application to the Governor of this colony to be supplied with seed of *Hevea spruceana* in exchange for some seeds and plants contributed to our Botanic Gardens, I was requested by His Excellency to take steps to procure this seed, together with seed of *Iriartea exorrhiza*, the Booba palm of Guiana, which was included in the requisition. From my previous experience I was aware that seeds of the Booba would not be obtainable before October or November, but I was not acquainted with the fruiting season of the Hatie, which is the local Indian name of the required species of *Hevea*.

I left town on the 7th September, 1880, prepared with the necessary appliances for collecting and preserving both growing plants and herbarium specimens; so that, in case of failure in my search for the *Hevea* seed, the journey might not be without profit. The run up the Essequibo river to the mouth of the Mazaruni was made against a heavy ebb tide, and it was consequently late in the afternoon when the steamer reached the Penal Set-

tlement, for which place she had a considerable quantity of goods, the landing of which caused a further delay to us as we wished to go on shore at Kalacoon, on the opposite bank, near which place the steamer has her moorings. About five o'clock she reached there, and the Captain very kindly put us and our goods on shore. On our way up, a barque lay loading greenheart timber at the mouth of the Groote Creek, and another was passed at Bartica Grove taking a similar cargo. During the afternoon squalls and heavy showers of rain were experienced on the river. Kalacoon is the residence of Mr. McTURK, the Special Magistrate of the river. His house is on the brow of a hill, and commands one of the best views of the river in the colony, better I believe than any other occupied place. The Mazaruni runs immediately beneath; on the opposite shore is the Penal Settlement with its quarries, prisons, and residences open to view. Far down to the right stretches the Essequibo river with Kaow Island, and one or two others more remote, in sight; while the left commands a fine view of the Cuyuni river, and the range of mountains beyond, with much heavy forest to the north. Having seen no other high ground in the colony, I looked with much interest on these mountains, the vegetation of which is as yet untouched, and would certainly reward investigation with a rich harvest. A heavy, sombre mist was rising from the river and adjacent lands, drifting along the range, and hanging on its sides.

In the absence of Mr. McTURK, I took the liberty of sheltering our goods in his boat-house, and to save making a clearing and rigging hammock coverings strung our

hammocks in an outbuilding. The heavy rain of the afternoon had saturated everything with moisture which had not dried, and, sleeping in hammocks without covering, the temperature at night appeared very cold, though as registered by a minimum thermometer, it only went down to 70° Faht. It did not however descend again to this ; the next lowest being 73°, to which I have observed it has since fallen on one occasion in Georgetown. On the bushes about Kalacoon the scarlet passion-flower (*Passiflora coccinea*) was very common and, being in bloom, produced a very noticeable effect. Higher on the river it was also abundant in half-open places. It is a plant well worth cultivating, though I have not observed it in any garden in town. In the morning while a crew was being procured, we went through the woods at the back of Kalacoon collecting specimens to dry. Not many were however obtained. Comparatively few flowering plants are found in the shade of a dense forest. If the situation be moist, cryptogams are generally plentiful, but flowering plants are generally represented only by members of the natural orders *Aroideæ*, *Musaceæ*, *Palmæ* and two or three others closely allied. Nature as represented by vegetable life appears unwilling to hide her charms in obscurity. Sunshine is essential for their full development and display, and it is interesting and not uninstructive, to notice the incessant strife, the crowding and crushing of the weaker, the advantage taken one of another. In a forest all the functions connected with reproduction are carried on over-head. The surface of many a tree would present a bright and gorgeous sight when in flower could it only be seen. For not only do the trees

display their own bloom, whether its character be attractive or not, but their lofty crowns are also made a convenience of by other plants to the same end. Slender creepers ascend the trunk, or lift themselves from branch to branch till they reach the height they need; and innumerable forms of epiphytal and parasitical subjects find lodgment on the branches.

A crew having been obtained, we left Kalacoon for Kaow Island, intending to examine the river side vegetation on the way down, for which purpose we moved slowly, keeping close along shore to get what was in flower on the way. What appears a curious freak of nature is commonly exhibited here and in other parts of some rivers by several species of Orchids, which clothe the upright stems of such bushes and trees as grow within reach of the tide. Orchids, as a rule, delight in a moist atmosphere but are very impatient of too much water, and where the surplus is not speedily withdrawn they show signs of decay, and in a short time die. The stems and leaves of the orchids now before us were, however, coated with mud-like slime, and are evidently covered periodically by the rising water. How they bear this submersion and the after exposure to the sun, from which the sparsely branched bushes afford little if any protection, it is not easy to conjecture. They are, however, generally quite healthy, but bear exceptionally few stems and an unusally large quantity of root-fibres, which latter twine round and quite encircle the supporting tree in a densely interlaced mass. This arrangement, whatever the influence causing the unequal development of the different parts, is doubtless a provision of nature to

enable the plants to withstand the severe strain and drag of the tidal current of the river. Those I obtained belonged to the genera *Epidendrum* and *Brassavola*, but others may also be procured. I gathered flowering specimens of a small form or variety of the delicately sweet scented *Epidendrum fragrans*, and also of *E. nocturnum*. Creeping along the shore slowly, something constantly appeared, to be gathered. The very beautiful *Petrea Schomburgkii* was seen twining up the bushes and throwing its spikes of bloom where they could be best displayed. These are much finer than those of the commonly cultivated *P. volubile*, being sometimes nearly as long as one's arm. Another handsome creeper was a robust species of *Dioclea* (probably *D. glabra*) with densely packed spikes of purplish red flowers and glossy trifoliate foliage. A second species was found later, on our way to the falls, not less showy in its bloom, but with coarser leafage. Before we started I explained to the Indians of the crew, as well as I was able, what I was principally seeking. I told them it was a milk yielding tree, and described the character of the foliage. They did not, however, recognize the plant. We had proceeded about a mile, carefully scouring the banks en route, when, as the boat was drawn to the shore to obtain something else, the object of our search was discovered by my fellow traveller. It was only a small tree, however, almost hidden by others, but flowering very freely, and I gathered copious specimens. On seeing the tree the Indians at once recognised it, and the word Hatie, quietly uttered, passed from mouth to mouth. Just at that time a heavy shower and a

strong wind from down river met us, and we found it necessary to leave the spot without further search, and to push hastily on for some place of protection from the wind and shower. Near this point, a short way above Bartica Grove, Mr. PIERCE, the Church of England minister of the station, has his residence. He was about to undertake a missionary journey to some Indians on the Potaro river, beyond the Kaieteur,* and had asked me to join him, having heard that I was anxious for an opportunity to examine the flora of the unexplored region above and about the Fall, so I called to speak to him on the matter. He was, however, not at home, and we proceeded to Kaow island. Several plants of interest were seen here, and specimens gathered, but after a careful scrutiny of the vegetation, the *Hevea* was not detected. Much of the vegetation has been removed to make room for the leper hospital belonging to the Penal Settlement which is here established. On the way back to Kalacoon two or three more trees of the *Hevea* were discovered, also in full bloom. These were about twenty-five or thirty feet high, and twelve to fifteen inches in diameter of trunk. They were standing in a clump, on the edge of the low water-washed bank, and leaned out over the river. Night was drawing in, and prevented my entering to examine the forest. The leaves are trifoliate, apical, on long stalks crowded towards the ends of the branches, from between which the flower opens. The leaflets are entire, oblanceolate in shape,

* On the return from a second journey to the Kaieteur, just a year later, Mr. Pierce with nearly his whole family was drowned in descending Marahee fall.

acute, polished green above and glaucous beneath. The flowers are very numerous, but insignificant in size, about two lines long, nearly white, and of distinct sexes, the females being few and situated above the males, at the ends of the branchlets. The fruit is a three-cornered capsule, the carpels of which, while hanging on the tree, split in two at maturity with an elastic expansion, liberating the seeds with a jerk. The latter are about the size of a small nutmeg, and nearly of the same shape, but more rhomboidal. Fish are particularly fond of the seed. As the capsules burst, their contents drop on the water where the trees are on the banks and overhang the river, and the surface is immediately broken by cartaback rushing after them. The Indians employ the fruit while in season to bait their fishing lines. The fruit, however, is said to be poisonous to some animals. Having doubts of the identity of the species, and being anxious to have the question definitely settled, I sent a set of each of the two forms I obtained to Kew to be matched. The following note by Professor Oliver, the keeper of the Herbarium, was received from Sir Joseph Hooker in reply:—"With regard to the *Heveas* sent by Mr. Jenman (No. 621 and 725), I have examined them carefully and believe they both belong to the same species, and that they are identical specifically with *H. pauciflora*, Mull. Org. (*Siphonia pauciflora*, Bth.) and H. Spruceana Mull. Org. (*Siphonia spruceana* Bth). Of these two names the latter should be adopted—the type specimens of *H. pauciflora* being evidently abnormal as to the infloresence, and the plant flowering in copious panicles.

The original *Hevea guyanensis* of Aublet was based upon specimens in fruit, of which flowers were unknown. The *Hevea* identified by Largot, and in conjunction with Aublet's plant is quite distinct from Mr. Jenman's. The name to adopt here is *Hevea spruceana,* Mull. Org. This satisfactorily settles the identity of the plant."

The Indians, having once seen the tree, appeared quite familiar with it, and promised to take me next day to a locality where I should find many, and larger specimens. Early in the morning we started to see these trees. The place was not far distant from where we discovered those on our return journey the previous evening. They were very plentiful. The situation is a tract of low alluvial land along the bank of the river, which in the rainy season is quite submerged, often apparently deeply. At the time of my visit the water had just shrunk away in the general fall of the river, consequent on the cessation of the heavy rains in the interior a month or six weeks before. Residents on the rivers say they never remember the water to have been so high as it was during the past season ; but though there had been little diminution of rain in the lower parts, the rivers had subsided rapidly, showing that on the great water-sheds of the interior the rain had in great measure ceased.

The exceptionally heavy rains experienced on the coast lands were evidently general throughout the colony. On landing, the ground was found to be still quite soft, and it was hardly possible to walk without sinking to the ankles or deeper in the surface deposit of mud. The forest was high and dense, producing a deep gloomy shade within, and there was little under-growth. The

Hevea was scattered irregularly among other subjects. The plants varied much in size; the largest observed and measured did not exceed from 18 to 21 inches in diameter, or from 40 to 60 feet in height. As a natural result of confinement in dense forest, the trunks were here straight and unbranched, but on the banks of the river and creeks, a situation they seem to prefer, they are branched, much stouter and hardly erect, but lean out in the centre, in the effort to steer clear of their closer-growing neighbours. No ungerminated seed was obtainable; but I picked up some of those which had just sprouted, and some of the exploded capsules to complete my dried specimens. Seedling plants from one to three feet high seemed very common. If there were any demand for them a man might gather them at the rate of five or six hundred a-day; selecting only the smallest, chiefly those of the current year, I gathered about one hundred and forty in an hour. Their abundance indicates unmistakably that the fruit ripens, and the seeds drop during the spring dry season. Were it to fall while the floor of the forest is covered with water it would inevitably float away, and even that which lodged among brushwood and exposed roots would hardly germinate successfully. September is the flowering season, and April and May is, I think, the fruiting season. I have since discovered that some Hatie seeds were purchased with a collection last May; which circumstance proves the correctness of my inference as to the time of fruiting. Having had a couple of quakes made for the reception of the plants and lined with mukroo (*Ischnosiphon*) leaves, I packed them carefully in soil

and left them till my return to town, in a cool spot in the forest at Kalacoon. The third day we left Kalacoon, at mid-day and proceeded up the river. Again proceeding slowly along shore, another Hatie tree was met with, standing alone, about a mile from our starting point, blooming even more profusely than those previously seen. Being fully exposed to the sun and isolated, its leaves were much more membranous than those of its specimens already gathered; so I took from it another set. Our progress was very slow. The bank of the river abounded with a great variety of plants in flower. A beautiful species of Vanilla (*V. aromatica*) with slender cord-like stems, and large singularly shaped flowers producing slender finger-like pods, which, however, appeared only slightly aromatic, grew commonly from branch to branch, and hung in festoons from their ends. Among the rocks at the water-side, a large-flowered species of *Eugenia*, covered with pink apple-like bloom, was found now and again. In attempting to pull some specimens, down came a shower of the fugitive petals, leaving the tree shorn of much of its beauty. As evening was closing in, after a short pull across the river, we reached the settlement of Cartaboo in advance of a heavy squall which was coming up from the Essequibo. This settlement is chiefly occupied by half-breeds. This spot is one of the oldest occupied places in the colony, and possesses some of the largest mango, bread-fruit, and avocado-pear trees I have seen. A family being absent and their benab vacant, we were permitted to take possession of it for the night. In the morning, while the water was low, I explored the shore

for some distance, and afterwards examined the forest near by. Nothing of particular interest was obtained. The village straggles across the front of a somewhat elevated ridge, which terminates in a bank, ten or twelve feet high, by the river. The ground in front is low and partly submerged at high tide.

At mid-day we left to push on to an Indian settlement situated on an island a few miles further up. The ground passed during the afternoon was more elevated than that passed the previous day, and in some places the abrupt escarpment, which was several feet high, is similar to that of the Cartaboo settlement.

In one place where I landed, the sandy floor of the forest, ascending gradually from the river, was thickly strewn with plants of the beautiful *Schizæa elegans* with its handsome tasselled fan-shaped fronds standing erect. In many places we passed a great quantity of Mora, and in some it appeared to be the only occupant. Several species of Wallaba were everywhere abundant, *Eperua falcata* being the least of all. Manniballi *(Siphonia glolulifera)* made a very beautiful display with its profuse clothing of richly-deep scarlet bloom against the back-ground of dark shining foliage. Here as on the other principal rivers there was an abundance of *Ruyschia souroubea,* a creeper which, ascending the top of the trees, trails down their sides in long whip-like shoots, with shining foliage, crimson flowers, and spherical marble-sized fruit. Of less common occurrence, but having the same habit, only less common, was *Cacouria cocinea.* Probably no other plant of the Guiana flora is more striking than this when

in bloom, and, being a pale scarlet, it is seen a long distance. The fruit is oval and the size of a pullet's egg, with angular ridges. The Indians regard it as highly poisonous. As a forest tree the *Simaruba amara* was likewise common.

When we reached the village, the women were busily engaged burning pottery, which they were finishing that evening to carry to town next day. They come the whole distance in their ordinary river-canoes, creeping, we were told, slowly along shore until they reach the coast, to avoid the risk of getting swamped. When living on the Corentyne river last year, we saw two or three families of Caribs who had recently gone there to live, having travelled the whole distance from the Essequibo river, nearly the entire seaboard of the colony, in their canoes with their goods, suggesting a faint idea of the courage displayed in remote days in the navigation of the savage races. From the station on the Mazaruni, the journey to town and back occupies a week or more; that they should prefer to come by bateaux though the Penal Settlement steamer calls twice a week within a few miles of their home, and almost within sight of it, is one good instance, among many, of the little value these people put on time and labour and how little they appreciate the convenience of civilization. One of the five or six benabs which constitute the dwellings of the settlement was readily given for our use, and as evidence of possession we at once slung our hammocks in it. After I had emptied my vasculum of the gatherings of the afternoon and laid the specimens in to press, I found time to look around, and was not a little disgusted to discover

that preparations had been made for a paiwarie feast, which was to take place that night. A benab had been prepared for the entertainment, by having the sides, which are usually open, thatched round. Unfortunately it was the next one to ours. The people living here were all pure-blooded Indians, but shortly after our arrival a negro and a half-breed came, and several more arrived in corials during the evening. No Indians were among these guests or strangers. It being Saturday, the party broke up at midnight, by which time there had been abundant evidence shown by the vomiting that the usual indulgence to excess had been observed. Whether paiwarie feasts, regarded as purely an Indian institution, be an evil or not to the race, there can be no question that negroes and half-breeds use them to corrupt and demoralize the people. There was no mirth or dancing; it was simply a drinking bout, and the conversation was most depraved and vile. The Indians appeared to take no part in it beyond listening and indulging in much empty laughter when the spectators appealed directly to them. Immorality is not an Indian vice; whatever else they be chargeable with, all travellers attest their comparative innocence and pure-mindedness; and the attempts made to debauch them are acts of vandalism. It is not surprising that witnesses of these scenes should question the benefit derived by the red-skinned population of our forests from intercourse with civilization.

As I turned my specimens next morning into aired paper, the Indians, men and women, stood around and looked on with apparent interest, mentioning by name in

soliloquy, as is ever their habit, the different plants they recognised. One would have liked to know what they thought was the object of such work, or if any such thought occurred to them at all, and how, with their phlegmatic nature, which rarely displays interest or feeling, they regard the enthusiasm manifested by travellers at the first sight of new forms of life.

Pacou *(Pacu myletes)*, a large well-known fish which frequents the rapids and other parts of the rivers, and is shot by fishermen with arrows when the waters are low in the dry season, was common. At the station there was a good deal of it salted, and some crews were away up the river engaged in fishing. There was some activity at the time in collecting locust gum, a product of the Locust-tree *(Hymenœa Courbaril)*; and a negro crew passed us on this errand. The gum is found in the debris of the decayed trunks in compressed layers, as if it had been run in moulds, a few inches thick. It is clear and transparent like amber, and usually quite pure. Little is known as to how or at what time the deposit takes place, but it seems to occur in the early stages of decay. It is found also in hollow living trees, but never in or under sound ones. For the last couple of days we had passed no palm but Kokerite—*Maximilliana regia*. On the lower part of the Essequebo river Æta (*Mauritia flexuosa*) is very common near the mouth, and a short way up the Manicole *(Euterpe edulis)* abounds. Higher again Tooroo (*Œnocarpus baccaba*) is very plentiful, while here and there by the water-side dense clumps of Pimpler palm (*Bactris palustris*) occur. At Kalacoon I met with two species of this genus with

which I was previously unacquainted. Here too *Astrocarium gynacanthum* was prevalent, and one spadex of its fruit was obtained. In the forest above Kalacoon some plants of *Dalebanna* (*Geonoma* sp.)—and Booba *Iriartea exorhiza* were observed, but they were not plentiful, and two or three clumps of Awarra (*Astrocarium tucumoides*), or a closely related species, were passed on the banks of the river.

From this Indian settlement we proceeded to the First Falls, as the first rapids on the river are called. Here we made a camp and remained for two days. The solitude and animated river and forest scenery make the locality very charming. Again, the banks which apparently closely shut the river in are not the shores of the river, but of the first of the many islands which, beginning at this point, form a long series, breaking the water for miles. In the open streams, reefs of rocks appear, against which the current surges, chafing and foaming over the top; and sandbanks, crisp as snow to the tread, line the shore. We went up the rapids as far as time would permit, and examined the woods and shores *en route*. A mile or so above our camp a woodcutter's benab was seen —a large building appearing not to have been recently occupied. During the first day at Kalacoon so many plants new to me were found in flower that I expected the number of new forms to become less day by day as most have an extensive diffusion within certain limits, and are met with over and over again, and our journey would not extend far enough for a very considerable change of subjects to be anticipated. But day after day there was no diminution in the number of novelties.

In the forest within reach of the camp, the trees were covered with aroids, some of which were very interesting. One I was particularly pleased with and gathered a number of plants for its promise of usefulness in conservatory and house decoration. A near ally of the Aroids (*Carludovica Plumeeri*) was much more common than I had seen it elsewhere. There was hardly a tree that it had not ascended, a greater or less distance. It was flowering, and specimens were gathered with copious bundles of delicate fugitive stamens still adhering. This is the Marmourie of the Indians, used as a substitute for rope, a plant of great service to them. It is considered the very best material for tying. Split into thin layers, it is largely used in the manufacture of the light open-mouthed baskets called quakes.

Probably no stronger basket in proportion to weight is made from any material; and they are not only light but possess almost as much pliancy as a net. Two kinds of Mamoorie are reported to exist, differing in degree of toughness. By the river, the trunks of the trees are covered with three species of the beautiful filmy ferns. One, *Hymenophylum ciliatum*, in broad masses, the moss-like fronds lapping over each other, looked exceeedingly pretty. Here and there on the out-stretching branches was found a tiny form of *Hiphopterio serrulata*, while similarly situated were patches of *Monogramma immersa*. The region is remarkably low for all these plants, and their presence indicates abundance of atmospheric moisture as a compensating condition. One plant of a beautiful species of *Lycopodium* with dichotomously forked, convolute, pendant

branches, two or three feet long, was gathered; and in the sand of the bed of the river were found large grass-like patches of the little Adder's tongue. *Ophioglosum macrorhizon,* where it was covered daily by the rising water, which is here not free from tidal influence. When the river is full the beds are constantly submerged. Numerous instances occur of plants, not only living, but thriving under conditions so unfavourable to normal vegetation as total submersion, for periods more or less long at regularly recurring intervals. These are the subjects which brighten the shores of the rivers. While they are exposed during the dry season, is the time of their activity. Presumably while the rains last and the rivers are so full that they are constantly covered, they are dormant. The phenomenon is remarkable. Several fresh illustrations came under my notice on this journey arresting our attention. The only satisfactory explanation seems to be that as invaders of new domains these plants have, in the course of a long succession of years, accommodated themselves to the prevailing condition by external change, which there is evidence to show has only gradually taken place. Orchids were numerous on the overhanging branches; but only two or three kinds were in flower. Two specimens of *Pleurothallus,* not in bloom, clothed the more exposed limbs; in several places the rocks were covered in large patches by a species of *Ligea* which just at the time was flowering freely. Seen from a distance, it appeared as a sheet of pink, and looked exceedingly pretty. The much finer rock plant *Mourriera fluviatilis* was not found here. All these plants

have thick fleshy root-stocks which adhere firmly to the rocks, so firmly in fact that it cannot be removed by hand without being crushed or injured. The leaves are developed under water while the river is full. They differ in species, but all are much crimped and pale in colour. They are so tender and membranous that it is impossible to preserve them by pressing and drying in paper. Freshly gathered they taste something like water-cress but lack its pungency. As the river shrinks from them in the dry season the leaves immediately shrink and perish, and the flower spikes at once appear. After a short time these, having accomplished their functions, are also dried up, and nothing remains but the crowded spike-like capsules. It is probable that the plants entirely perish after flowering, and are renewed from the abundance of seed which obtains a lodgment in the matted remnants of the old plants, and germinates with the rising of the rivers. It may however, be, that when the plants do not become entirely exposed they do not die. This was my judgment too from what I observed on the Cabalebo river. But I am not sure that they grow in places not periodically left above water.

The rapids were full, and so steep that the men had to get out in places and drag the boat through. How they keep their footing, up to their chests or higher in water rushing with great turbulence and velocity, and at the same time drag the boat along, is a mystery. Risky as the work seems, they delight in it.

This river presented a strong contrast to the Corentyne in the paucity of signs of animal life. On the sand where we landed, were the tracks, some days old, of a jaguar,

well embedded, winding with the line of the water; and as we stepped from the boat, a female iguana was caught with its tail out of the ground, intent on burrowing to lay its eggs. Some tracks of acuri (*Dasyprocta aguti*) were noticed in a few places in the forest. Besides a dozen or so of birds, mostly black *Ibis*, the only other animal seen was a small yawarri, (*Didelphys philander.*) I was afterwards told that game was to be had, but that it had become so shy from being much disturbed, that dogs were necessary to turn it up.

During the last three or four days of our journey the *Hevea* was not met with, though I was informed that it extends very considerably higher along the banks of the river. But time would not permit further ascent. The Indians here too know it just as well as those lower down, and recognised my dried specimens. Their habits are however so migratory that this alone would be insufficient proof of its occupying the district As far as I could gather, it is spread from the mouth of the Essequibo, where it is common on the banks and in the creeks to points high up on the same river and on the Mazaruni. It probably also occupies the lower regions of the Cuyuni. On another occasion I found it far in the interior on the Potaro River. It was not seen by me on the Corentyne. Judging from my own observation, and from the analogous case of *H. brasilinsis*, it appears chiefly to inhabit the alluvium along the shores of the rivers and creeks; yet I was informed that it is not strictly confined to this kind of ground.

From the falls we returned to Kalacoon, where we packed the plants, and the next day came back to

Georgetown by the steamer. Our dried specimens numbered about 800 specimens, representing 185 species.

India-rubber, or caoutchouc, and gutta-percha are obtained from several plants, trees, shrubs and climbers which inhabit several parts of the tropical world. These regions are, Africa, Madagascar, India, the Malayan islands and some of the Pacific islands and America, from Mexico to Brazil. The plants which yield india-rubber belong to the natural orders—*Artocarpeæ, Euphorbiaceæ, Apocyneæ;* and those producing gutta-percha to *Sapotaceæ.* The former are *Ficus elastica,* two or three species of *Hevea, Castilloa elastica, Manihot Glazeovii, Urceola elastica* and some member of the genera *Urostigma, Alstonia* and *Tabernæmontana;* and the latter, *Iromandra gutta* and *Mimusops balata.*

Ficus elastica is a large much branched spreading tree, sometimes a hundred feet high, with large, ridge-like roots elevated above the surface of the ground, and extending with tortuous curves as far as the branches reach. It is common in parts of India, especially Assam, and the Indian islands; and plantations of it, which are extended from year to year, have been established by the Government of India and Assam.

Hevea is a tropical American genus diffused from Guiana to Brazil. The best known species is *H. brasiliensis,* which yields the Para rubber, the best caoutchouc in the market; 7,340 tons were exported from the province of Para in 1879. Last year the quantity is reported to have been much less, and valued at £600,000. These

facts afford an idea of the importance of the trade, and the abundance in which the trees must exist, considering the small quantity yielding at a time by each individual. Attention has recently been directed to what appears to be another *Hevea* found in great plenty in the virgin forests of the province of Pernambuco and alleged to yield rubber of excellent quality, peculiarly suitable for certain heavy work, the demand for which is said to be so great that this article may soon rival Para rubber in the extent of its export. *H. brasilianis* is widely spread through central Brazil over the alluvial lands of the Amazon and other rivers and lands which are annually flooded. On the lower part of the Amazon it appears to be not clear of tidal influence. This tree has a close resemblance to *H. Spruceana* of the Essequibo River, and grows to about the same size. *Castilloa elastica,* the Central American rubber tree, has a wider geographical range and is not chiefly confined to the same low altitude. It is a much larger tree, being over one hundred and fifty feet high, with stems of four or five feet in diameter. The bark is thick and the wood exceedingly soft. Its growth is very rapid, and it is said to become large enough to tap in six or seven years. The juice runs abundantly, but it is inferior in quality to that of the Para tree.

Manihot Glazeovii—Ceara-rubber—is another Brazillian tree, a close ally of the cultivated cassava. The trade name of this rubber is derived from the province of Ceara in which it occurs. It is found plentifully in sandy, gravelly, or rocky situations, in half-open places or on wood-land which is much shaded. The province is

generally arid and dry in character, and is at times subject to long periods of drought which produces famine—a year sometimes passing without rain. This tree attains a height of fifty or sixty feet, with a stem about twelve or fifteen inches in diameter. Like its close ally the cassava, it is most easily propagated and may be raised either from seed or cuttings of the branches. This latter is the most expeditious method, as the hard seed, unless artificially prepared, either by soaking in warm water, or by careful incision or removal of a small portion of the coat takes many months to germinate. The Indians have noted this difficulty in the case of cassava seed, and mention a tradition that the great blessing of cassava would have been lost to the race immediately after it was given, as the seed would not grow, but for the accidental discovery that pieces of the stem reproduced the plant. There is no doubt that the Ceara rubber tree would thrive well on the light soil of the sand ridges and rocky places below about 2000 feet altitude in this colony. These situations are especially well suited for its favourable development, and the growth is so rapid that the labour demanded for its cultivation would be much less, even at first, than a provision field requires. This and the two immediately preceding belong to the family *Euphorbiaceæ*, the first to *Artocarpeæ*.

Urceola elastica of the family *Apocyneæ*, is a large climber, with a stem as stout as a man's body. It is found in Borneo, Sumatra and Singapore. Little is known of the other members of the natural order which yield india-rubber. Some considerable material has however been gathered toward the elucidation of the matter,

which is being worked out at Kew.

Other plants are known to yield caoutchouc, but mostly in insufficient quantity, or of too poor a quality to make its collection remunerative.

As I have already said, gutta-percha is produced by two species of *Sapotaceæ*, *Isonandra gutta* and *Mimusops balata*. That of the latter is the well known balata gum of this colony.

Isonandra gutta is a large tree found, like *Urceola elastica*, on the Malayan peninsula in Singapore. It grows to a height of eighty feet, the trunk being three feet or more in diameter. Another less well-known species of this genus affords some gutta-percha.

Mimusops balata—the balata or bully tree of Guiana —is next in importance. it is found in British, French, and Dutch Guiana: and either this or very closely allied plants are also found in Venezuela, Trinidad, and Jamaica. On points of the Berbice, Canje, and Mahaicony rivers of Guiana it is particularly plentiful. It is one of the finest forest trees of the country, eighty feet high or more, having a trunk two feet in diameter. The wood is hard and very durable. Two kinds are recognised by the balata collectors and woodcutters, which from their description are either well marked varieties or distinct species—a question it would be very interesting to determine. The first exportation of balata gum took place more than twenty years ago, when a small sample was send home for expirement. The quantity increased yearly, and in 1865 reached 20,000 lbs. In 1874 it fell to 1,669 lbs., which fetched £111 in the market. The next year the figures were 10,134 lbs., realizing only £114. 10. 0.

The following year's export was worth £145. 16. 8. In 1877 the business sprang up to 20,812 lbs., which sold for £1,040; and last year it reached the unprecedented quantity of 47,483 lbs., which sold for £2,543. 5 10. This was more than double the largest previous exportation in a single year.

With regard to local india-rubber, it is said that the numerous samples brought from the upper Essequibo, although of fair value, indicate that the process of preparation admits of great improvement. There is no information as to the source of this caoutchouc, it may have been derived from *Hevea Spruceana,* or some other species of this genus; or it may have been derived from other plants—which appear to be species of *Ficus* from which the Indians are known to draw this material.

About four years ago the India Office sent Mr. Cross, the intrepid and successful collector who has done so much service for this department in connection with the introduction of *Cinchona* into India, to South America to collect plants of Ceara, Para, and Central American rubber-trees. The plants he gathered were deposited at Kew, where they were propagated; and supplies were forwarded subsequently from there to the Botanic Gardens at Ceylon, for propagation for the India Government. In Burmah, Madras, and other places, experimental plantations have been made, in which it is hoped this new enterprise in the cultivation of new world plants, may become as firmly established in suitable districts as Cinchona cultivation has on the Nilgheri Hills and Sikkim Himalayas.

Of all the plants mentioned, *Hevea* is the most valuable. Thirty per cent of its milky juice consists of pure caoutchouc, while the juice of *Ficus elastica,* the next in value, is often found to possess not a third of this.

The existence of India-rubber was made known in Europe nearly five hundred years ago by the first visit of Columbus to the West Indies. The facts here mentioned regarding the history of the India-rubber have been principally derived from a course of lectures, by Thomas Bolas, F.C.S., published in the Journal of the Society of Arts. The natives were reported to be in the habit of making playing-balls of an elastic gum. The ancestors of most of the existing tribes, Ackawoi, Arecuna, Caribisi, Macusi, originally from the islands, having migrated hither, probably at different periods before the advent of Europeans in the New World, and are the living representatives of the extinct islanders from whom the earliest acquaintance with Caoutchouc was obtained. The juice from which they make these balls is derived from a medium sized tree, probably a species of *Urostigma,* thirty to forty feet high, with a trunk about eighteen inches in diameter. It runs very freely, and is caught, when it at once congeals, and is worked up by the fingers rapidly till a ball large enough to roll under the palms of the hands is made. This is continued for three or four hours, by which time the ball has become several inches in diameter. The rubber appears to be of the finest kind. The balls possess an extraordinary elasticity, springing high off the ground when dropped, by the mere force of their own weight. They are used at the paiwarie feasts: the

men standing round in a circle, beat them down with their hands, and they rebound high above their heads. Much laughter and merriment accompanying the game. Two hundred and fifty years later the Mexican Indians were found not only using playing balls, but manufacturing the gum into articles of domestic use, such as helmets, shoes and water-proof fabrics.

The first detailed information regarding its origin and application was published by LA CONDAMINE, a French naturalist, who resided at Para, where the inhabitants were in the habit of making candle-like torches of it, and even bottles and play-balls. Eventually from time to time parcels of the gum reached Europe, and attempts were made to utilize the substance in a variety of ways. Little success, however, attended these attempts until the discovery of the principle of vulcanisation brought india-rubber, it may be said, into general use. By vulcanisation the material is so altered as to resist to a considerable extent the action of heat and cold. Pure unvulcanised Caoutchouc at 0 deg. centigrade is rigid and unpliable, though when subject to a temperature of 100 degs. it becomes so soft as to be almost valueless for any of the purposes to which vulcanised rubber is applied. Since this discovery the scope of its application has rapidly grown, till it now forms a highly important industry. In the manufacture of scientific apparatus, and in the arts generally, it holds an unique place, and no known substance could be adopted as a substitute.

Caoutchouc exists in the form of minute globules in the milky sap of the bark of the plants which I have named. It is composed only of carbon and hydrogen in

about the proportion of one of the former to seven of the latter. When clean it is nearly colourless, and thin sections of it are almost transparent.

In the different countries and with the several kinds of india-rubber several methods, modifications of a common plan, are used in collecting and drying the juice. From his own observation in the forest Mr. CROSS reports that in collecting Ceara rubber, the collector on coming to work takes with him a stout knife and a handful of twigs to serve as a broom. Arriving at a tree, any loose stones or dust are swept from the ground round the base, and some large leaves are laid to receive the drippings of milk which trickle down. Some do not go to the trouble of sweeping the ground or laying down leaves, so that the milk becomes mixed with sand, dust, decayed leaves, and other impurities. The outer surface of the bark of the trunk is sliced off to a height of four or five feet. The milk then exudes and trickles down, some ultimately falling on the ground. After several days, the juice becomes solid; and it is then pulled off in strings and rolled into balls or put into bags in loose masses. Only a thin shaving should be taken from the bark, just deep enough to reach the milk vessels; but this is not always attended to. Collecting is carried on during the dry season only, when rain seldom falls. The system of collecting Para rubber varies with the different localities and collectors. The following methods I quote from Mr. CROSS'S report: "The collectors begin to work immediately at daybreak, or as soon as they can see to move about among the trees. They say the milk flows more freely and in greater quantity

at early morn. I do not attach importance to this statement, but I have recorded it. Another and more probable reason is that, as rain often falls about two o' clock in the afternoon, the tapping must be done early, as in the event of a shower the milk would be spattered about and lost. The collector first of all, at the beginning of the dry season, goes round and lays down at the base of each tree a certain number of small cups of burnt clay. At the small trees only three or four are put, but at the larger ones from eight to twelve are deposited. The footpaths leading from tree to tree are likewise cleared of sapling growths, and bridges over the *gapos,* natural ditches, formed at each place by the trunk of a tree. On proceeding to his work, the collector takes with him a small axe for tapping, and a wicker basket containing a good sized ball of well-wrought clay. He usually has likewise a bag for the waste rubber and for what may adhere to the bottom of the cup. These promiscuous gatherings form the negro head of the English market. The cups, as already stated, are of burnt clay and are sometimes round, but more frequently flat or slightly concave on one side, so as to fit closely when pressed against the trunk of the tree. The contents of fifteen cups make an English Imperial pint. Arrived at a tree, the collector takes the axe in his right hand and, striking in an upward direction as high as he can reach, makes a deep upward sloping cut across the trunk, which always goes through the bark and penetrates an inch or more into the wood. The cut is an inch in breadth. Frequently a small portion of

bark breaks off from the upper side, and occasionally a thin splinter of wood is also raised. Quickly stooping down, he takes a cup and, pasting on a small quantity of clay on the flat side, presses it to the trunk close beneath the cut. By this time the milk, which is of dazzling whiteness, is beginning to exude; so that if requisite he so smooths the clay that it may trickle direct into the cup. At a distance of four or five inches, but at the same height, another cup is fitted on; and so the process is continued until a row of cups encircles the tree at a height of about six feet from the ground. Another tree is treated in like manner until the tapping required for the day is finished.

This work should be concluded by nine or ten o' clock in the morning, because milk continues to exude slowly from cuts for three hours or perhaps longer. I may state that there is a great difference among collectors in the performance of these duties. Some take care to get good clay previously and incorporate it well, so that a very small portion is needed to attach the cups to the trunks; they also work with neatness and intelligence, and invariably collect a good quantity of milk. Others again do not take the trouble to prepare clay before-hand, but merely scrape up a handful when they require it at the side of a *gapo*, which is often of little consistence, so that a large quantity is required to fasten the cups. This class of collectors often have many fragments of clay or other impurities in their milk, the result of not following a proper method of working. The quantity of milk that flows from each cut varies, but if the tree is large and has not been much tapped the majority of cups will be

more than half full, and occasionally a few may be filled to the brim. But if the tree has been much gnarled by tapping, whether it grows in the rich mud of the flats or on the dry up-land, many of the cups will be found to contain only about a tablespoonful of milk, and sometimes hardly that. On the following morning the operation is performed in the same way, only that the cuts or gashes beneath which the cups are placed are made from six to eight inches lower down the trunks than those of the previous day. Thus each day brings the cuts gradually lower, until the ground is reached. The collector then begins as high as he can reach, and descends as before, taking care however to make his cuts in separate places from those previously gashed. If the yield of milk from a tree is great, two rows of cups are put on at once, the one as high as can be reached and the other at the surface of the ground, and in the course of working, the upper row descending daily six or eight inches while the lower one ascends at the same rate, both rows in a few days come together. When the produce of milk diminishes in long-wrought trees, two or three cups are put in various parts of the trunk where the bark is thickest. Although many of the trees of this class are large, the quantity of milk obtained is surprisingly little. This state of things is not the result of over-tapping as some have stated. Indeed, I do not believe it is possible to over-tap a tree if in the operation the wood is not left bare or injured; but where at every stroke the collector's axe enters the wood, the energies of the trees are occupied in forming new layers to cover the numerous

wounds. The best milk-yielding tree I examined had the marks of twelve rows of cups which had already been put on this season. The rows were only six inches apart, and in each row there were six cups, so that the total number of cuts inflicted within three months amounted to seventy-two. It grew close to a *gapo*, only eight inches above high-tide mark, and, being a vigorous tree, the cups were usually well filled; but with two years or so of such treatment the tree would probably be permanently injured. It has been supposed that the quality of the milk is better in the dry season than during the rains. Such is the case with some vegetable products, but as regards india-rubber there ought not I think to be any appreciable difference. In the rainy season the milk probably contains a greater proportion of water, but on the other hand I am of opinion that a larger quantity of milk flows from the tree. No doubt the dry season is the most suitable for caoutchouc collection, although wherever a plantation is formed with proper care, tapping may certainly be always carried on where the caoutchouc is found."

There are two other methods adopted in tapping, which are chiefly confined to the upper Amazon and its tributaries. Both are exactly on the same principle, the materials used being only a little different. The lower outside bark of the tree is cleaned off to a height of about three feet. Beneath, a gutter or raised border of clay is plastered on to the trunks, enclosing one-half of the entire circumference. Cuts are thickly made in the bark above this, from which the milk flows down to the gutter, whence it is conveyed into a calabash conveniently

placed. The other mode is by winding the stout flexible stem of a climber round the trunks, and claying it round securely so that no milk may creep between the trunk and the climber. These plans are not universally adopted and can only be successfully put in practice where the tree has not been previously tapped. There is always a great deal of 'negro-head,' in consequence of the distance the milk has to run and of the large quantity of clay employed in the process. Going from tree to tree at a sort of running pace, the collector empties the contents of the cups into a large calabash which he carries in his hand. As he pours the milk out of each cup he draws his thumb or forefinger over the bottom to clean out some which otherwise would at once adhere; indeed a small quantity does remain, which is afterwards pulled off and classed as negro-head. The cups on being emptied are laid in a little heap at the base of each tree, to be ready for the following morning. The trees occur at various distances from 10 to 100 yards apart.

The *Castilloa* trees are usually felled. Narrow rings are then cut round the trunk-bark, eight to ten inches apart, and the flowing juice is caught in a vessel or leaf placed beneath each cut or ring. If the ground is soft, as is often the case, log stretchers are laid at intervals at right angles to the direction in which the tree will fall, for it to rest upon. This is also the method practised in this colony in collecting balata gum. The trunks of balata trees are, however, sometimes drawn and squared for timber after the milk has been collected, but this is only practised to a very limited extent. A collector will

fell ten to fifteen trees a day, the greater number of which are allowed to decay.

It should always be remembered by collectors that as the milk is confined to the bark, none whatever being contained in the wood, nothing will be gained by cutting deeply; and, on the other hand that, if this be practised, permanent injury will follow, resulting in the tree becoming practically barren of milk, its essential death. If the work be done with intelligence and care, and the inner bark which exists in readiness to replace the outer bark and to repair injuries be not damaged, the incisions will soon heal, being but scars instead of ugly dilapidated fissures such as result from the careless method now followed.

The coagulation and first process of drying is effected by exposing the juice to the influence of the smoke of fires made of palm-nuts, and its complete induration by exposure to the air. After the milk has been collected, a fire is made of the fruit of one or two palms *Attalea speciosa* and *A. excelsa*, over which a sort of funnel is placed to keep the smoke concentrated; wooden hand-shaped bats are then taken, and having been slightly covered with fine clay, are dipped in the juice, and then held in the smoke till it has set, when the bat is again dipped; the process being repeated till the layers are an inch thick. The layer thus gradually formed is then slit down one side, removed, and hung up to dry and harden. The scrapings from the vessels, with cleanings from the cups and the scrapings from the incisions of the trees where some has trickled down and dried, is worked into balls, and forms the negro-head of the trade.

This usually contains much foreign matter, some of which is often put in by unscrupulous collectors to increase the weight at the cost of value. In other places, by the application of alum to coagulate the juice, smoke is dispensed with.

The first act in the process of manufacture is the removal of the foreign material accumulated, which is accomplished by boiling in water for some hours, and by mastication and washing by machinery. In this process a large loss in weight occurs, the amount depending on the way in which the juice was collected and the quantity of foreign matter inwrought. The reduction in the best Para is about fifteen per cent; in negro-head twenty-five; other kinds ranging up to as high as forty per cent. The cleaning having been done, vulcanisation is attained by immersing the purified material in a bath of melted sulphur, at a temperature of 120 deg. centrigrade, till it has absorbed ten to fifteen per cent of sulphur. If permitted to remain in, it would probably absorb much more, but not with advantage to its general industrial application. At this stage the sulphur is simply absorbed, and no chemical modification has taken place. To effect the chemical union, it is subjected to further heat, which is performed in a bath of glycerine raised to a temperature of 140 deg. centrigrade. This might be accomplished in the sulphur-bath by increasing its heat, but that, as just mentioned, an excess of sulphur would be absorbed. The result would be over-vulcanisation and production of a substance resembling that which is occasionally made and used under the name of ebonite. There is another process of vulcanisa-

tion largely practised, whereby the sulphur is worked into the white rubber, over which it is sprinkled after it has become plastic by mechanical pressure with heated rollers. Mineral colouring matter is also incorporated. Sometimes a great variety of matter is wrought in to reduce the quality, such as fuller's earth, white lead, magnesia, sulphate of lead, clay, chalk, zinc, &c. Rubber containing this addition has lost its elasticity in a large degree. Red rubber, which is recognised as superior to grey, is vulcanised by sulphide of antimony to which about twenty per cent of sulphur has been added.

Gutta-percha is a closely allied substance to india-rubber, their chemical composition being almost identical; but in practical application they are found to differ widely. Gutta-percha is characterised by a considerably greater plasticity under heat, but possesses little power of tension and is much less porous; so that for the great majority of purposes one material could not be substituted for the other. For certain purposes, however, the two are sometimes combined. It was introduced to England nearly forty years ago, and the trade very speedily developed. It forms an excellent insulator in electrical operations, and is one of the best non-conductors of heat. It is largely used for covering wires and cables, and, when vulcanised, in water and in other ways. When protected from light and air, it seems almost unaffected by lapse of time. It can be vulcanised in the same way as india-rubber. Uncured, at a temperature of 50 deg. centigrade it becomes soft, and at 100 deg. it is sticky and paste-like. The fresh milk hardens by mere exposure to the air in shade, without being subjected to smoke.

There appears to be no limit to the possible application of caoutchouc. Day by day its use extends in the industrial arts; and the increase and permanence of the supply become questions of commercial importance. The supply hitherto has been obtained from natural sources. There is no question that in some of the regions mentioned above, the trees producing caoutchouc exist in abundance; but this is the result of their natural development and increase during the ages before the value of their juices was discovered. Naturally, those of the American Continent are well fitted by nature to hold their own, if not to disposses others, in the ever active struggle for existence. The commercial demand for caoutchouc has however brought into existence a force that is inexorable, against which nature unaided has never yet shown itself able to contend successfully; and the result, though its effect may not be at present felt and by the accident of discovery it may be long deferred, must be that the trees, in proportion to their separate merits, must be cultivated. Indeed, as I have mentioned, the first steps toward this end have already been taken. The enterprise might be most successfully carried on in this colony. Some of the trees are natives to the country, and, growing wild in their natural state, may be made productive without the expenditure of money and time usually incurred, as the price of experience in new cultivations.

At first, natural plantations might be formed, requiring little labour and care, in the forests where *Hevea spruceana* or any other species is found. Where the trees abound plentifully, it would simply be necessary to fell

sufficient of the other trees to allow seedlings to grow up, nourished by light and air, weeding out as well other kinds of seedlings and undergrowths. A plantation formed in this way would require no care after the trees had got a good start. Under favourable circumstances the growth is rapid, and all the best conditions would exist in such selected situations. In ten or twelve years the young trees would be large enough to be tapped. By encouraging the growth of young plants, and cutting away any that become exhausted, the plantation would be permanently maintained in good order. The situation being natural, all the circumstances favouring the highest development would at once exist, aided by the suppression of detrimental conditions at the hands of the planter. Nor would there be any great difficulty in making plantations in suitable areas hitherto in possession of other trees. I have already mentioned that in certain places seedlings are most abundant. Under any circumstances it would be necessary to remove many of these, to prevent overcrowding. All the undergrowth should be removed, and enough of the trees felled to admit the light and air necessary for vigorous growth. The young plants should then be carefully lifted and replanted at suitable distances—say fifty or more feet according to circumstances. If taken up with moderate care and not unduly exposed before planting, the seedling takes at once to its new quarters, and loses no growth by the change. As they grow, any trees in their way should be removed; and this with care in restricting the undergrowth, would be all the labour demanded.

In districts suitable for the cultivation, but where the

tree is not found, the best plan to obtain plants would be to sow seed, which is very plentiful in the fruiting season. There would be no difficulty in raising a large number of seedlings in nursery beds. They should be formed on ground not likely to be flooded in the wet season, possessing a little shade. The seedlings make by far the best growth under the influence of slightly modified sunlight. The seed should be sown thickly and covered lightly with leaf mould or any similar forest rubbish. They spring up rapidly after germination, and in six to nine months would be large enough to be finally planted. In collecting plants which have grown up spontaneously, those of the current year's growth should be preferred. Those and those alone may be transplanted without risk. They are readily recognised by the green unjointed stems. The older plants have the normal grey bark of the nature tree. Cuttings taken from lateral shoots will root when inserted deeply in cool shady places. But where seeds or seedlings are obtainable, this latter system of propagation is not to be recommended, as it is somewhat more difficult and uncertain and occupies some time.

Enterprising collectors of ballata-gum would do well to turn their attention to india-rubber, and test the value of *Hevea spruceana* in caoutchou, as compared with the other known species of this genus. The fact of the greater demand for the india-rubber, and its greater worth, especially that derived from plants of this genus, over gutta-percha, should not be overlooked. Woodcutters and others acquainted with the forest trees of the colony, would do well to use their knowledge, and search for

the india-rubber trees. I have before mentioned that there are probably two or three species of *Hevea* in Guiana. *H. Guyanensis*, according to Professor Oliver's note is one; and two species of *Siphonia* are mentioned by Schomburgk. Some of these are doubtfully distinct; but however this may be, there are species of *Ficus* and *Urostigma* the commercial value of which it is important to ascertain. Para-rubber was last quoted at 3s. 2d. a lb.—a slight reduction on previous prices.

On the Influence of Boiling on Cassava.

By Ernest E. H. Francis, F.C.S., F.I.C.

IN 1796, Dr. Clarke of Dominica on describing the fatal effects resulting to negroes from drinking bitter cassava juice, compared the action of the poison to prussic acid, and Dr. Fermin, by experiments made at Cayenne, proved that the poison like prussic acid, was volatile and could be isolated by distillation. Subsequently, M. M. Henry and Boutron-Charland by analysing bitter cassava juice imported into France, ascertained that the poison *was* prussic acid, and, in 1838, Dr. Christison confirmed their discovery by an examination of some well preserved juice from Demerara.

Notwithstanding this early identification of the poison, no attempt had apparently been made to determine the quantity yielded by the plant, until in the year 1877, the present writer (then in Trinidad) undertook an inquiry into the subject. An examination was made not only of bitter cassava but also of a number of samples of sweet cassava, and contrary to expectation the latter were found to contain nearly as much prussic acid as the former. The results of the inquiry are published in two memoirs, the first in the London *Analyst* for April 1877, the second, a more extended one, in the *Proceedings of the Scientific Association of Trinidad*, for the same year.

Fifteen samples of sweet cassava were obtained from the public markets and from different cultivators in

Trinidad, and every one of them contained prussic acid, nine out the number (or 60 per cent), yielding sufficient from one pound of the root or half a pint of the juice to kill an adult.

The following summary shows the average as well as the highest and lowest quantities of prussic acid, that were met with in fifteen samples of sweet and ten samples of bitter cassava :—

	Sweet Cassava (15 Samples.)		**Bitter Cassava** (10 Samples)	
	Per cent. of Prussic Acid.	*Grains of Prussic Acid per lb.*	*Per cent. of Prussic Acid.*	*Grains of Prussic Acid per lb.*
Average	·0168 ...	1·175 ...	·0275 ...	1·927
Highest	·0238 ...	1·666 ...	·0442 ...	3·094
Lowest	·0113 ...	0·791 ...	·0132 ...	0·924

Full particulars as to the mode in which the prussic acid was estimated have been already given. It will be seen that no great difference exists in the amount of prussic acid in the two varieties: one pound of either root would, on the average, furnish a fatal dose of the poison.*

It appears that the older cassava grows, the more poisonous it becomes. It is known to local provision farmers that the variety of sweet cassava called "Buck-stick" is harmless when young but poisonous when old. The writer examined one very old specimen of sweet cassava. Some of the tubers were of immense size, and almost globular in shape. They yielded ·0352 per cent. of prussic acid, equal to no less than 2·464 grains to the pound. From an amount of juice equivalent to three pounds of the tubers there were obtained 6½ fluid drachms of diluted prussic acid of British Pharmacopæia

* Dr. Taylor fixes the poisonous dose of prussic acid at one grain, but at the same time reports the case of a healthy woman who died in twenty minutes from a dose containing nine-tenths of a grain.—*On Poisons*, *3rd edit.* p. 594.

strength; a quantity sufficient to destroy the life of six adults.

Further experiments have recently been made by the writer on the influence of heat on the poisonous properties of cassava, and have proved that prussic acid does not exist ready formed in the tubers but is developed when they are sliced or grated. Moreover, moderate cooking (boiling) prevents the formation of prussic acid almost entirely. In both these respects cassava is like the bitter almond, in which no prussic acid exists until it has been crushed and mixed with water: then by the action of a peculiar ferment (synaptase), a crystalline principle (amygdalin) existing in the almond is decomposed into hydride of benzoyl, glucose and prussic acid. By first boiling the almond the power of the ferment is destroyed and no prussic acid can be obtained.

No doubt amygdalin exists in cassava but the attempts made to extract it have not yet been successful. The following experiments, however, show that cassava is affected by boiling, like the bitter almond.

Two tubers of bitter cassava weighing together 112 grammes (about a quarter of a pound) were thrown whole into a flask of boiling water connected with a Liebig's condenser. The contents of the flask were then slowly distilled into a closed receiver containing a small quantity of water made alkaline with pure caustic soda. After one hour and a half the distillation was stopped and the distillate tested for prussic acid, but none was present. On cooling, the boiled tubers were removed from the flask, mashed in a mortar with water, returned to the flask and re-distilled. Again, no prussic could be found

in the distillate. But one hundred grammes of the same sample of cassava *grated raw*, mixed with water and distilled in the same way gave ·0444 gramme of prussic acid, equal to 3·094 grains in the pound.

Thorough cooking is necessary however to altogether prevent the development of prussic acid in cassava, as the following experiments show.

A large sample of sweet cassava was obtained, and by three separate determinations it was found to yield when grated raw an average quantity of 1.551 grains of prussic acid to the pound. Less than three-quarters of a pound would therefore furnish a poisonous dose of the acid.

Five hundred grammes (rather more than one pound) consisting of three whole roots of the sample were plunged into boiling water, and kept boiling moderately for one hour. The roots were then taken out, allowed to cool, and after being mashed with water, the prussic acid in them was estimated and found to be .0294 grain in the pound. It would therefore require 34 pounds of the boiled root to yield one grain or a poisonous dose of prussic acid.

Five hundred grammes of the same sample were then boiled for half an hour, cooled, mashed with water and the prussic acid determined as before. They yielded .0325 grain of prussic acid per pound or one grain from 30.7 pounds of the boiled root.

Five hundred grammes were again boiled for 15–20 minutes and on cooling yielded .084 grain of prussic acid per pound, or one grain from 11.9 pounds of the boiled root.

Farming and Irrigation.

By the Hon. William Russell.

IN writing a paper upon the importance of a plentiful water supply in connection with cattle farming or grazing, I might refer to what has been done in the East from the earliest history of our race, also to the grand works that have been constructed on this continent for the conservation of the precious element, but this is not my object. This paper is intended to trace, 1st.—What has been done in the way of water conservation by those who have gone before us; 2nd.—The reason why so little has been done; 3rd.—Its importance, especially in respect to the profitable raising of stock; and, 4th.—How a supply may be secured at a trifling cost.

First: When we come to examine into the works done by the early settlers of this colony to conserve water, they may be briefly described as none. It is true that in laying out the plantations, a space was left between every second estate for what was known as a bosom or Company Canal. These canals were intended to act as safety valves to the back dams of the estates when the natural small creeks became stopped-off by the works of poldering, and advantage was taken of this force to keep the drainage channels clear of silt; and even when the water gave out in dry weather, advantage was taken of tidal influence to fill the bosom with tidal water, which was shut in by the sluice at its junction with the sea until

low water, when the gates were opened, and the rush of pent-up water assisted materially in clearing out the silt from the canal mouth. Canals were also laid out in such a way as to gain the advantage of the scour of the rivers and creeks to keep the drainage open, as may be seen in the abandoned canals connected with the Mahaica, Mahaicony, and Berbice Rivers, and on either side of the Demerary. The internal Canals Nos. 1, 2 and 3 on the Demerary, and the Grand Canal, Berbice, were simply highways for opening up sections of the colony, affording both navigation and drainage, such as may be seen to-day in Holland. But none of these works can be described as conserving *fresh water.* The earliest marks of an attempt to barrage any of our rivers and creeks is to be found at the junction of the Lama with the Grassy Creek. Here are the remains of what would seem to have been a rude stop-off made with stakes driven into the bed of the creek, against which water-grass and other debris must have been packed and which to a certain extent must have checked the flow of water to the east; but now that it is known that the land in this neighbourhood is only 51 G.D., it is evident that any barrage of the creek without side dams must have had little effect. No one now living can give any account of this work or when it was done, but I presume it dates from the time of the Dutch. I am not astonished to find so few marks of water conservation in the Dutch time, because, as a nation, they have been more famed for keeping off water than for conserving it; and in the Holland of to-day no large works are to be found for impounding water for purposes of irrigation; and with a climate like that of

Guiana, with its two wet and two dry seasons, said to have been more regular in the past than at the present day, it is not to be wondered at that more was not done to provide against droughts. Moreover, the early settlers were scattered over the upper reaches of the Rivers where sweet waters always abound.

Second :—About the year 1826 the colonists seem to have been moved, by a calamitous drought, into action; for about this time the Lamaha Canal was projected, and canals from the Abary and Canje Creeks were started and carried a considerable way. The various lakes on the Aroabisce Coast date from about this time, but depressed markets seem to have checked the growing energy and probably the "it will serve my time" of the present day intervened, and the water question was allowed to go to sleep. Early in the thirties, another calamitous drought again reminded the colonists of the want of water, and again several plans were set on foot to impound water, among the rest the Boerasirie Scheme; and an attempt was made to make a more permanent barrage of the Lama. Gordon's Stop-off was made. Disappointment followed all these works, because too much stress was laid upon tidal influence. The Planters saw on the sea board a tide rise 10 feet high which would put their lands 3 feet under water, and they supposed that this influence extended to the upper reaches of the Rivers and Creeks, and that a Canal tapping the upper waters would give a plentiful supply. Canals were dug which, contrary to expectation, led the water the wrong way. This fact and bad times again relegated the water-supply to dream land. In 1868–69 another drought occurred, and the New Water

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Works in Georgetown calling for an augmented supply, the Lamaha Canal was examined and found, after its 41 years' service, to be silted up to a considerable extent,—in fact it stood in want of a thorough digging. A good deal of discussion took place, and at last it was decided to dig a branch canal, known as the "New Cut," to tap the Anira, a branch of the Lama some 4 miles further down stream than the junction of the original Canal with its Creek. The work was executed and it is unnecessary to refer to the result;—water as usual ran down hill. With the Lamaha Canal gradually getting from bad to worse, and the City having experienced a water famine (during which water was brought from the upper reaches of the Demerary for the use of the City and the Villages along the East Coast), Sir JOHN SCOTT began to think it time to do something if only to quiet clamour, and in 1873 he issued a Commission to inquire into the Water question. It is unnecessary to follow this vexed question beyond this stage, as the history of it must be fresh in the memory of all those taking any interest in its solution. Doctors have differed to such an extent that men of small means are afraid even to think of helping themselves.

Third:—As to the importance of a plentiful Water-Supply, one has only to drive overland from Georgetown to Skeldon, first in the wet season when the pasture lands have the appearance of velvet. Perhaps no finer stretch of grazing ground is to be seen in any country than the fine rolling sward with just sufficient clumps of trees to form shelter, to be seen stretching to the south of, for instance, "Glazier's Lust" and "Prospect," in

the Mahaicony district, with fine, fat, sleek cattle luxuriating in the fattening herbage, all giving tokens of cattle-farming being an apparently profitable undertaking. Let the same journey be taken after three months of drought, and what a transformation has taken place! The velvet-like grass is replaced by stunted dried-up herbage, on which the meagre emaciated cattle can scarcely keep hide and bones together; at every turn cattle are seen in all stages of exhaustion, scrambling through partially dried-up trenches in search of the dregs of muddy water, while in many of these sticky sloughs the old and weak cows are making their final struggle. Carrion crows are seen luxuriating on the dead carcases, and the well picked bones of not a few dot the plain, giving a livelihood to bone collectors, who gather the dried-up bones for the manure manufacturer. On some of the large cattle farms artesian wells have been sunk, which afford drinking-water to the flocks; but the supply is too limited to serve for irrigation. I have no hesitation in attributing the want of general success in cattle-raising in this Colony, to the great mortality which takes place every dry season. It is then that old cows which have gone on breeding for 15 or 20 years succumb to the want of food and water,—animals which ought to have been fed off at a much earlier age, as is done in other countries, for the butcher.

The dark green couch grass, which is *the* pasture grass of British Guiana, thrives wherever the land can be covered with water for a time, and of all the means of improving its growth I know nothing to equal a crop of rice. Land that may be covered with coarse herbage, sour grass, sage, and such like, on being slightly stirred

with the Egyptian or Indian plough, placed under water, then planted with rice, and kept just covered with water until the rice is reaped, is found to yield a cover of delicious water couch, and this continues for years. Mr. TROTMAN, of De Kinderen, who has carefully studied the subject of pasture recommends that these lands should be drained in wet weather and put under water when the weather is dry. I have followed this advice with all the pasture paddocks under my charge; and with good results. If the grass plots are kept too wet, a growth of beeza and fine rushes are apt to choke the finer grasses.

Fourth:—Within the last five years our knowledge of the behaviour of Savanahs and Creeks has been very much increased by experiments in several localities. For instance, it is now well known that an important creek may be stopped off without the flooding of the surrounding country that was formerly dreaded; and this is explained by the fact that the whole country through which the creeks wind is almost a dead level, varying only from 51 to 56 Georgetown Datum. It is also well known that the average rain-fall in any one season does not exceed 4 feet, and that, between evaporation and absorption, only 3 feet of this is available for storage. So that in reality it would require no great ingenuity on the part of the Water Engineer if he were called upon to conserve the entire rainfall over any given district. I am quite aware of the damage that has resulted from time to time from breaches in dams, and this was more general when dams were made at first depths with land at 52 G.D. Now, poldering has extended so far inland that the site of dams is generally upon land at 54 to 56 G.D., and

this, added to more care in dam making, has rendered accidents to dams very rare. One thing noticeable in the opening of a rainy season is the quickness with which the water rises until 56 G.D. is reached. After that, although the heaviest rains may pour down, no perceptible rise is seen on the gauge staff, and this is accounted for by the entire area of the country being covered with water, so that there are no streams coursing down from higher ground. 56 G.D. being high Spring Tide level, all the rivers and creeks at that level are constantly in motion towards the sea. This being so, it is perfectly safe for any district to impound the natural creeks to 56 G.D. without throwing any undue pressure on the neighbouring dams. My own opinion is that all dams ought to be made with their crown at 60 G.D., at which height the security is absolute. I may just remark that the highest mark reached in the Lamaha Canal in my time was 56.35, and this with the main creek, Lama, was entirely closed by an earthen stop-off.

With regard to the water stored in the rear of the cattle farms, all of which are abandoned Cotton Estates, with the remains of back and side dams and the corresponding canals,—these latter may at a trifling cost be made the channels for distributing the water over the different sections of the grazing grounds. A very slight assistance given to nature and a system of warping from vegetable growth may be practised. I was forcibly impressed with this fact when working in the overgrown creeks in connection with the Lamaha canal, where men were sawing out an overgrowth of vegetation 3 feet thick and apparently perfectly solid; this formation is going

on every day. The description given by Col. Gordon of how this goes on in the Nile is so applicable to British Guiana that I copy it. The following description might have been written of the Lamaha, barring the hippopotami. We disturbed some fine alligators and camoudi :—

"I have made enquiries, and find that Baker cut through some 80 miles of the "sudd" or vegetable barrier; the other day my steamer found this quite closed up.

... ... A curious little cabbage-like aquatic plant comes floating down, having a little root ready to attach itself to anything: he meets a friend and they go together, and soon join roots, and so on. When they get to a lake the current is strong, and so, no longer constrained to move on, they go off to the sides; others do the same, idle and loitering, like everything up here. After a time winds drive a whole fleet of them against the narrow outlets of the lake and stop it up. Then, no more passenger plants can pass through the outlet, while plenty come in at the upper end of the lake; these eventually fill up all the passage which may have been made. Supposing I cut through the vegetation, I may have it closed any day by a wind blowing a floe of these weeds from one side of the lake to the other; so that the only way would be to clear out the lake of vegetation altogether, or to anchor the banks of "sudd" so as to prevent the winds blowing them together. Below Gondokoro it spreads out into lakes; on the edge of these lakes an aquatic plant, with roots extending five feet into the water, flourishes. The natives burn the top parts when dry; the ashes form mould, and fresh grasses grow, till it becomes like terra firma. The Nile rises and floats out the masses; they come down to a curve and there stop. More of these islands float down, and at last the river is blocked. Though under them the water flows, no communication can take place, for they bridge the river for several miles. Last year the Governor went up, and with three companies and two steamers he cut large blocks of the vegetation away. At last one night the water burst the remaining part and swept down on the vessels, dragged the steamers down some four miles, and cleared the passage. The Governor says the scene was terrible. The hippopotami were carried down, screaming and snorting; crocodiles were whirled round and round, and the river was covered with dead and dying hippopotami, crocodiles and fish which

had been crushed by the mass. One hippopotamus was carried against the bows of the steamer and killed: one crocodile, 35 feet long, was also killed. The Governor, who was in the marsh, had to go five miles on a raft to get to his steamer."

A similar cabbage-like aquatic plant may be seen floating down any clear water until they are arrested by a snag or tree branch and then an island begins to form; this is most noticeable in the Anira and its branches, and along the canals which were dug to form wing dams. The little plants are carried along by the stream and at the end of the canal they have formed quite a barrier to the escaping water, so much so that the water is now checked about 18 inches higher than it was in October, 1878, the water at west of stop-off being 53.75 against 52 at the same date in 1878. In the same way a little attention in directing the vegetable aquatic growth, and water may be guided at discretion. On the Aroabisce Coast the sand dunes already form the back dams; and at a trifling cost the water could be made to follow the foot of this ridge from creek to creek, as is now done where lakes are already formed.

Having thus endeavoured to clear up any doubts that may linger in men's minds as to danger from pent-up water, I shall now attempt to lay down simple rules by which to lay an embargo upon our creeks so as to store water against seasons of drought.

A system of caisson sluices has become quite common now, for placing such adjuncts to drainage and navigation at extended points along our fore-shore which could not be done except at an enormous cost and risk, without some such appliance. The caissons are equally eligible for

forming a barrage in any of the creeks of the Colony where the water does not exceed 5 feet in depth in dry seasons.

The mode of fixing them is simplicity itself. The caisson is fitted together with ends closely planked up, it is then floated to its destination. A few men with shovels and rakes prepare a bed in the creek, and on the water being admitted, the caisson quietly settles down into its bed, and if it is found to be on an even keel it remains in position, but if it is not level the water has to be pumped out and the bed made fair for the second trial, and very seldom has a third to be made. The planks are now unbolted and the water finds its way through the caisson, sluice, or lock, as the case may be; paals are driven and the four corners are sheet-piled preparatory to filling in with earth; the iron work is also built upon with timber and planking to the desired height to which it is intended to confine the water. Of course the spot selected in the creek ought to be where high land or sand dunes come close down to the creek banks, so as to shorten the wing dams necessary to confine the water.

When it is decided to make a lock suitable to pass sea punts and other craft, the ordinary lock gates at each end become necessary, with the length sufficient to lock the usual local trader; this requires 60 feet in length by 14 wide, and would, in position, cost $6,000. An ordinary sluice with winding up gear, 30 feet by 14 feet, costs in position $2,200. A barrage for an ordinary creek, with house on top for watchman, and with an arrangement of panels to be dropped into a groove, instead of a solid door to regulate the height of water,

say 18 feet wide by 30 feet in length, may be placed in position for $3,000. This I consider the most suitable where there is only bateau traffic, as a sliding could be made for hauling over, similar to what is placed at the west side of Tapacooma.

To those wishing to gain more experience on these heads, I recommend a visit to the very fine lock, on the caisson principle, which connects Pln. Anna Regina with the Tapacooma Lake. For lock sluices, I would mention those placed at Vreed-en-Hoop, Windsor Forest, Leonora, Uitvlugt, &c., &c. And for a barrage with simple lifting panels, I would name the one placed in Lamaha Canal, at No. 1 Benab. With such a contrivance as the latter, placed in any of the various creeks which intersect the Colony, a trifling extent of wing dams, where necessary, would secure a plentiful supply of fresh water from Skeldon to Capoey, and the cost, if borne by the general tax-payer, would be such a trifle as compared with the benefits of cheap and wholesome flesh diet, that I trust another decade will not roll past without its accomplishment.

A writer in the *Argosy* has lately described a novel and very excellent way of cheap dam-making. I take the liberty of reproducing the article:—

BEAVER DAMS.—In connection with the Water supply question a new name has sprung up in connection with dam making; and being of an enquiring turn of mind I set a day apart to pay a visit to the Boerasirie, where I was informed, "Beavers" were at work in dam making. On arriving at the stop-off on the creek, I found a gang of men at work assorting saplings of bush and grass in a cradle or frame-work of spars driven into the ground in the shape of an X, into the V part of which the saplings, etc., are placed until a mass about two feet

thick is formed; a rope with an eye at each end, is now drawn round the mass and a hand-spike is placed through the eyes from different sides, when the whole is twisted into a fascine some twelve inches in diameter. A piece of bush rope is securely tied at an interval of every foot in length until the entire mass, some 30 feet long, is like a solid rope. Leaving the fascine makers and proceeding into the savannah for some distance, I observed a dam of fascines which is made as follows: spars about four to five inches in diameter, are securely driven two or three feet into the ground in rows five feet apart, and about two feet from each other; into this space the fascines are firmly packed and all fine grass and debris is sucked by the dammed-back water into the crevices between the layers of fascines. Some of this work done two years ago is now quite tight, resembling as it does, a wet sponge; and the work now in progress, with a head of two feet of water against it, is wonderfully tight already, and I was told that in a month's time it would simply weep a trifle of water. On getting into the high wood, the real work, which has given it the name of Beaver, is seen. A line is blazed across the woods and a gang of men are at work with rakes and strong round-edged turf knives in clearing away the underbush for a couple of roods on the site of what is to be the dam. The heavy trees are now felled in such a way as to fall on the line of the dam, the force in falling being generally sufficient to lay them flat to the ground. The branches are then trimmed off and interwoven in such a way as to hold all light floating matter which is drawn into the interstices between the branches by the pressure of the water; a clear space is made on the side on which the pressure bears, to facilitate the conveyance of water, grass, fascines, etc., which are called for to complete the packing of the dam.

Such is, roughly, a description of work which seems to be admirably adapted for preliminary damming-up of water for experimental purposes, and the wonder is that it has been so long in being introduced into this colony. I was informed that breaches in back dams, at one time looked upon as a great calamity, have lost all terrors to the beaver fraternity, for they throw a semicircle beaver dam at a considerable distance away from the breach and a fascine dam is constructed in less than no time.

The intention of the present work is to gain two feet more head against the coming dry season, as without this wing dam to the west, the water can escape waste to 56 G.D. and at the end of last dry season the water in the lake went down to 54, a datum quite high enough for

the estates below Leonora; but that important block and Cornelia Ida would have been short of a water supply, if the drought had continued another fortnight. It is now expected that the additional 2 feet of head secured will be sufficient to supply all the estates without the level going below 56.

With such an example set on the West Coast, the natural question arises, What is being done on the East Coast and other districts? The answer is, Nothing. Cannot those interested in a Water Supply for their properties take heart of grace, bury all petty jealousies and follow such a safe and inexpensive example as has been carried out on the Boerasirie?

In closing these hastily thrown-together notes, I trust a full discussion may be made upon them, and, in the meantime, I offer and invite an inspection of the work now entrusted to my charge on the Boerasirie, which is, I think, the thin edge of the wedge which ought to lay the log open.

The British Guiana Exhibition of 1882.

By the Editor

ON various occasions local Exhibitions have been held in Guiana, chiefly at times when the colony, having been invited to compete at some one of the great international Exhibitions, French, American or English, it was desired to gather together the products of the colony, that a proper selection from these might be made and forwarded to the greater show. On the last of these occasions, in 1877, it occurred to the Government that by organizing a series of Exhibitions for more purely local purposes, opportunities would be afforded for stimulating production in the colony in more various directions than has been the case throughout the many years during which attention has been solely, or almost solely, devoted to advancing the sugar industry of this colony. The result was the organization of a series of biennial Exhibitions, the first of which was held in 1879, while the second has but just closed. It is proposed here to note some facts in connection with the most recent of these Exhibitions, and chiefly to note how far there are indications that the intended purpose of encouraging production, not only of sugar, but also of all other native forms of industry, and thus of assisting the very heterogeneous inhabitants of this land, is being attained.

But before turning to this main purpose of these notes, it may be as well to record that, even in connec-

tion with the first of these biennial Exhibitions, the idea originated of inviting competition from neighbouring colonies situated much as is our own, and thus, on the one hand, of strengthening, even if only in small degree, the somewhat loose bond between the various very disconnected places usually thought of by the outside world as one whole, under the name of the West Indies, and, on the other hand, of showing to the people of our own colony the many points in which they are far behind the people of neighbouring colonies in variety and, especially, in neatness of industry. In accordance with this idea, our neighbours in the colonies of Surinam and Cayenne were invited to compete at the Exhibition of 1879; and by a further extension of the same idea the Exhibition of this year was opened to nearly the whole of the West Indies. And the success of this opening of our Exhibitions having been, taking various disadvantageous circumstances into consideration, already very marked, it is to be hoped that on the next occasion the Exhibition will be opened to the whole of the West Indies, including under that somewhat vague name, Dutch and French Guianas. Nor should this phase of the subject be left without a mention of our gratitude to the people of Cayenne and St. Lucia, who of all our invited guests have as yet responded most liberally to our call, and have thus set an admirable example to all other West Indian colonies.

In turning now more immediately to the contents of the most recent Exhibition, it may simplify our work if it is at once pointed out that, as is necessarily the case, the exhibits were very evidently divisible into two great

classes, the one comprehending sugar, the other all miscellaneous products, or in other words, the one consisting of the one product about which any trouble is here taken, and the other including all those other products which are produced, either because they more or less directly tend to the making of sugar, or because nature unassisted produces them, and man, tempted by the hope of gaining a prize for them at the Exhibition, collects them if he happens to stumble over them in his idle moments. As regards the former of these two classes, no words are necessary to explain the statement that the production of sugar is the one industry here earnestly undertaken. As regards the latter class, all who think for a moment, will realize the fact that of the exhibits other than sugar, some are produced solely as an indirect means of making sugar, either because some things, such as cattle and garden produce, are necessary as the food of the sugar makers, or because others, as race-horses, art productions, and needlework, are necessary to the amusement of some of the sugar-makers themselves or of those who minister to their wants ; nor is it difficult to realize that all exhibits other than sugar, such as the fibres, the dried plantains and cassava, the oils, and the barks, are sent to the Exhibition, not because there is any endeavour to produce them for practically useful purposes, but because they are easily made or gathered, and may win a prize of a few dollars for the exhibitor. This is an unsatisfactory state of things and certainly does not indicate that the purpose of these Exhibitions of encouraging variety in our industry, is at present being attained. And yet these

vast collections of miscellaneous objects even now, though most of them are sent with no practicable design of utilizing them commercially, may be of great service in that they serve to show the outside world the wealth which is really to be had here, so that the day may come when some one, noting these things, may examine into the question of how far these small industries might be developed and extend into great commercial undertakings.

It may be as well here to point out that the usefulness of such Exhibitions might be enormously increased if it were part of the duty, we might almost suggest the chief duty, of the Exhibition Committee to select such products as seem most promising, and to enquire into the possibility of utilizing these, by having the exhibited samples properly analysed, so as to ascertain their quality, and by further enquiring as to the best means of collecting in large quantities those which prove to be of real value. For example, at the recent exhibition there was a really fine show of barks used medicinally by the negroes and aborigines of this colony. To the thoughtless, these rows of bundles of bark were far from interesting; but to any one who thought over the matter, it must have been apparent that among those apparently uninteresting bundles were almost certainly some, perhaps many that, were their virtues known, might, as quinine and many other similar drugs have done, alleviate human suffering to a degree with which the imagination almost fails to grapple. But at present, these barks after being exhibited are thrown unexamined away; for they exist in such vast quantities in the forest that the owners take no trouble to reclaim them. It would be easy to have

these barks properly examined; and it would be easy, in the case of those which prove to be of any considerable value, to make arrangements for their collection in large quantities with the best results both philanthropic and commercial; nor, as may once more be pointed out, would a central depot, either under government management, or still better, as a commercial undertaking, for the purchase in large or small quantities of such natural products as these barks from the Indians and river-men be a thing difficult to organize.

A case parallel to that of these medicinal barks may be shown by the following quotation, from an Official Report by the Government Analytical Chemist, on certain tannin barks submitted to him for analysis:—

"The following table gives the percentage of leather yielding by each of the samples and the amount of tannin calculated therefrom:—

Number and Names.	Per Cent. of Leather	Per Cent. of Tannin.	Re-action with iron per Chloride.
1. Mora	20·7	8·28	Bluish-black
2. Carrapa	26·2	10·48	Greenish-black
3. Buck Wallaba ...	11·0	4·40	" "
4. Eucaballi	23·3	9·32	Bluish-black
5. Kakaralli	19·3	7·72	Greenish-black
6. Eturey Wallaba ...	6·9	2·76	" "
7. Mapurakuni or Maypaie.	15·5	6·20	" "
8. Suradani	5·5	2·20	" "
9. Curacura	4·3	1·72	" "
10. Darkuma	28·3	11·32	" "
11. Baboreybador (rope) ...	5·1	2·04	" "
12. Determa	5·6	2.24	, "
13. Mora bouquet ...	23·6	9·44	Bluish-black
14. Crab wood	2·8	1·12	Greenish-black
15. Black wood	0·4	0·16	" "

Judged by the amount they contain, the samples numbered 1, 2, 4, 5, 10 and 13 are chiefly worthy of no-

tice. But, according to Mr. Barclay, the trees yielding samples 2 and 4 are not plentiful; they may be dismissed, therefore, without further comment. Sample 1 contains a fair quantity of tannin, but yields a dark and ill-coloured leather, while the chief objection to sample 5 is the moderate amount of tannin present. Both these barks, however, can be obtained in large quantities, and are, no doubt, worth attention. The remaining samples, 10 and 13, appear to be excellent in every respect and deserve a strong recommendation for trial. They contain a very fair amount of tannin, and the leather they yield is exceptionally light coloured—that from sample 13 being the better in this respect. A partial analysis of these barks gave the following results:

	10.	13.
Water	12·67	13·27
* Portion soluble in water	24·50	17·70
Ash	2·23	4·83
Woody matter	60·60	64·20
	100·00	100·00
* Containing tannin	11·32	9·44

Although the bark of the black mangrove (*Rhizophora mangle*) is not comprised in the samples collected by Mr. BARCLAY, yet, I may mention, it should hold a high place amongst the tannin materials of the colony. Properly used it tans with great rapidity and it contains a large percentage of tannin as the following analysis shows:—

Water	13.33
* Portion soluble in water	33·53
Ash	5·48
Wood matter	47.76
	100·00
* Containing tannin	15.76

Further search would, no doubt, bring to light local tannin material of a richer and better quality than any yet examined; but even those at present known should be sufficient to form an important industry for the colony."

Again, although the mineral productions of Guiana are neither numerous nor important, another example of our neglect of useful products was represented at the Exhibition by a sample of a mineral earth, shown by Mr. JOHN SEALY, which is described in the following letter:—

DEAR SIRS,—We have carefully examined the mineral powder sent us by you, and have consulted several of our friends as to its commercial value. The mineral is in the main hydrated protoxide of iron, aluminia, with small proportion of lime, magnesia, sandy grit or silicious matters, and magnetic iron. It contains the merest trace of gold, and no silver. On being heated to a dull red heat, it loses part of its water and assumes a darker colour. The heating of part of the sample sent us must have been very imperfect; as there is hardly any perceptible change of colour. It does not harden in water; is therefore not a pozzolona. It is however a *very useful*, and we might say *valuable pigment* quite equal to terra di Sienna from which it can hardly be distinguished. The colour, when rubbed in oil, is deep and pleasing, and the value of the article, for large quantities is estimated at from £2 to £3 per ton.

Your's, etc.,

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But it is now time to review briefly and in order the various contents of the Exhibition.

As regards the sugar shown there is little to be said. There were the usual beautiful white crystals, of little commercial value; there were the usual straw sugars; and there were for the first time, or at least the first time in any number, samples of the dark coloured re-

fining sugar which is now being made in the colony in enormous quantities. And none of these were much better nor much worse than on previous occasions. The only new features in this part of the Exhibition were the presence of some foreign samples of sugar from Dominica, Trinidad, and most numerous of all, from St. Lucia, and the presence of a novel sample of fine white sugar made without the use of copper-wall or animal charcoal, but simply by steam-clarifier, triple effect and vacuum pan, at Pln. *Providence* in Berbice.

Some misapprehension seeming to prevail on the subject among the non-technical inhabitants of this sugar-land, it may be as well to point out that the white sugars, and the refining sugars are judged according to *polarization, appearance,* and *marketable value.* A few critics of the Exhibition, not understanding that not only would it be against the rules under which competition was invited, but that it would also be most unfair to judge these sugars merely by polarization without consideration of appearance, were unnecessarily disturbed by the very natural fact that the prize was not in all cases awarded to the sample with absolutely the highest polarization. It would perhaps have been undesirable to allude to this but for the importance of calling attention to the facts of the case in every possible way before the next Exhibition.

As regards food-products other than sugar, there were present in somewhat unusual numbers, the usual preparations of plantains, bananas, bitter and sweet cassava, fruits and vegetables. Cocoa and coffee were more abundantly shown than has ever been the case before, and

there seems to be some indication that the cultivation of these two articles is at last being more and more largely undertaken. We cannot pass without notice the splendidly large cocoa pods exhibited by Mr. TIRIN of Surinam, or the fine Liberian coffee sent by Dr. H. A. A. NICHOLLS, of Dominica. But as regards the mass of home exhibits in this whole class, we can but reiterate our complaint that they are for the most part produced merely spasmodically, for Exhibition purposes, and do not indicate any constant industry.

Some notice should also be paid to the very considerable exhibit of rice by the free East Indian immigrants, recently and very wisely placed at Huis t'Dieren, where they receive a grant of land in lieu of the passage back to India due to them at the expiration of their years of indenture. This Huis t'Dieren Settlement is the first earnest attempt to settle, in place of constantly importing, merely to re-export, Indian immigrants in the colony and so to build up a permanent labouring population; and it must have been no little satisfaction to those who started this wise scheme to see some small, early earnest of its success in the fine samples of rice forwarded from there. Two samples novel to most visitors to the Exhibition, one of pounded, the other of parched rice, were among the Huis t'Dieren exhibits.

One remarkable exception to the prevailing somewhat uninteresting excellence of these food products was the splendid series of tropical fruits preserved entire and unchanged as regards both colour and taste, by Mr. ALEXANDER COURTENAY, who writes of them as follows:—"The preserved fruits exhibited were

prepared in December, 1881, and were found on opening the jars after the Exhibition to be in perfect condition, and quite equal to the fresh fruits. The medium employed is as harmless as pure water, and is without colour, taste or smell, and may be employed for a variety of purposes. The Exhibitor is not at liberty to make known the composition of the ingredients used as he is in treaty with several large firms as to the preparation of colonial fruits for exportation."

As a matter of fact, with the exception of some fig bananas which had very slightly lost colour, the colour and fresh appearance of these fruits was perfectly preserved. Whether, taking into consideration the necessarily heavy cost of sending fruits in bulky packages of liquid to Europe, Mr. COURTENAY may ever find it possible to supply mangoes, bananas, sapodillas, custard apples and all other tropical fruits in a state indistinguishable from the fresh state to Covent Garden and other European Markets at a remunerative price, we are uncertain, and must continue so while we know nothing of the original cost of putting up these fruits; but there can be little doubt that examples of fresh tropical fruits preserved by this method would be very highly valued as specimens in European Museums of economic botany, such as that at Kew, where badly made and coloured models and dried specimens alone are now available as illustrations of tropical fruits.

Among fibres a fine sample grown on the Demerara River, apparently equal to the finest "Sea Island," but really inferior to that variety in length of staple and in strength, served to indicate the quality of what might

be grown there. Another sample was sent from Pln. *La Bonne Intention* on the East Coast of Demerara River, where the abandoned land between the cane-fields and the sea, is covered with cotton plants which bear so luxuriantly, that but a few weeks ago the whole place was as white as though covered by snow. It is instructive to add that on that occasion the attorney of the estate having offered high wages for picking this cotton, having even offered as an experiment the value of the cotton in the Liverpool market, the black creoles of the East Coast, whose chief work is to cry that they have no work, could not be induced to pick, and the whole crop was wasted.

Among chemical products a long line of samples of cocoanut oil first met the eye, some being of excellent quality. Machinery having recently been introduced into the colony for the extraction of this oil, it is to be hoped that the large quantity of cocoanuts annually produced, it being no longer remunerative to export these, may be utilized by the extraction from them of this useful oil.

A more curious if less useful exhibit was a bottle of the fat of the "Camoodie" snake (*Eunectes murinus*) which is largely used by the Indians and, especially, by the black people as a medicine.

Tonka beans and locust gum appeared side by side. These two articles are now exported from the colony in no inconsiderable quantities.

Lucust gum, gum animi, or simiri gum (for it is known by all these and other names) is the product of the locust tree (*Hymenœa Courbaril*). This tree which

is by no means uncommon, occurs chiefly in sandy soil. The gum, unlike that of most other trees, occurs in nearly all cases in the soil at the roots, and very rarely, and then only in small quantities, on the bark. Two explanations of this fact have been given; one, that the gum exudes from the roots of the tree "in a vertical direction in columns or pieces upwards of a foot in length;" the other, that it arises "from exudations from the branches of the tree dropping in the sand below." The true explanation appears to be that the gum never separates in any large quantity from the woody fibre of the tree until the timber is rotten. Most probably, when the fibre of the wood decays, the gum is left unaltered. This theory is favoured by the fact that the gum occurs both in considerable quantity in the soil under the growing tree, and in much greater quantity wherever a locust tree, now fallen and decayed, once stood. In the first case the presence of the gum is due to the decay of the fallen branches, just as, in the second case, it is due to the decay of the whole trunk. Moreover in both cases the gum occurs in long pieces, which evidently indicate the longitudinal direction of the decayed branch or trunk. As to the value of the gum, I may state roughly, that even in Georgetown it will fetch £30 or £35 per ton; so that the very little trouble requisite for collecting it is certainly well repaid. In one case, enough simiri gum to fill eighteen barrels was collected from a single spot where a locust tree had once stood.

Another somewhat similar substance, shown at the Exhibition in large quantities, was balata, the hardened

juice of the bullet tree (*Mimusops balata*). For many purposes this is an admirable substitute for caoutchouc, and as it may be had in almost unlimited quantity in the colony a large trade might be done in it. As a matter of fact a trade in it was started, and grew to very considerable proportion. A ready sale was found for the substance; and then the trade suddenly ceased. The cause of this cessation lay in certain well-intentioned but mistaken proceedings of the then well-known colonist, Sir William Holmes. The juice of the bullet tree is collected in a fluid state, very much resembling milk in colour and consistency, but when exposed to the atmosphere the outer layer of this milk hardens. This harder part being collected and pressed into shape, a new layer is allowed to harden, and is then treated in the same way. Thus a mass of hardened balata is gradually obtained; and in this state it is exported. But this process of hardening is slow. Sir William Holmes, knowing that the milk hardens much more quickly when alcohol is added to it, induced the balata collectors to adopt this method of accelerating their work. Unfortunately balata when hardened by aid of alcohol, loses its most valuable quality, that of elasticity. The buyers in the European market finding the quality of the balata so much degenerated refused to purchase. So the trade ceased, and it is only now reviving in some small degree.

As an illustration of the character of balata, the following story is not without interest. The milk is not unpalatable, and is frequently drunk by the collectors. On the Canje Creek where it is collected more abun-

dantly than elsewhere, a collector having drunk a considerable quantity of the milk, proceeded to qualify it by drinking another considerable quantity of rum. The result was that the milk hardened in the man's intestines and caused his death. It is asserted, I do not know with what truth, that at the post-mortem enquiry, it was found that a cast in balata of the intestines had formed.

As a matter of fact, balata might be used with advantage in taking casts. Even in our Exhibition there was shown a beautiful series of vases, and an especially beautiful series of leaves, modelled in this substance.

Moreover if a thin sheet of soft balata is applied to the surface of any engraving or printed matter, and is then carefully removed, it will be found to bear a facsimile of the engraving or other design. Both these applications of balata might be turned to considerable service. It is perhaps as well to note that of all the natural productions of the Guiana forests the three with which we have last dealt, tonka beans, locust gum, and balata, are alone collected at present with any pretence at system.

Of the barks shown in this section of the Exhibition we have already spoken. There were several large series, which should have formed, perhaps, the most interesting feature of the show.

Among the miscellaneous chemical products exhibited, special mention must be made of the new sugar discovered and exhibited by our energetic Government Chemist and called by him "Laurite," of which mention will be found in another part of this Journal, and also of the finely prepared samples of drugs exhibited by Mr. ALEXANDER COURTENAY.

Amongst the very miscellaneous exhibits in the class devoted to "Miscellaneous Articles" it is very difficult to pick out any for special notice. They were numerous and very various in merit. Of the sketches and drawings, those of Guiana scenery were far surpassed by some admirable, but slight sketches sent from St. Lucia. Three pencil sketches from Cayenne by M. L. Fournereau, were worthy of notice for the extreme care with which they had been drawn. Mr. Hawtayne's sketches of negroes were as usual so clever that their somewhat weak drawing was completely forgotten. It was curious to watch the black visitors to the Exhibition examining these drawings of their kind. The pleased acceptation by these people of these studies of their eccentric selves afforded another example of the fact that the negro, who belongs to a class generally absurdly highly but extremely badly educated, is not pained by, because he is not intelligent enough to recognize the very pathetic funniness of his kindred. It may be added that Mr. Hawtayne's clay models of negro heads were, from an artistic point of view, far in advance of his sketches.

Of the needle work we can only notice four pieces of embroidery in gold and silver by a free immigrant; and we only notice these in order to point the moral of their extravagant price. The East Indian at home, where wages are low, and wants are few, produces the most elaborately beautiful embroideries for a small price; but when transported to this colony, where wages are high and his wants are many, he has to charge enormous and perfectly prohibitory prices for

such work. This circumstance is of course satisfactory in so far as it indicates a great advance in the prosperity of the East Indian by his transport to this country.

The objects of Natural History shown were numerous but very badly prepared. From this condemnation we must however except the splendid casts of fishes, made by a new process of his own, shown by Mr. M. R. Mattis of Surinam. Another collection which seemed to attract less attention than it deserved was a fine series of Carib stone implements from St. Vincent, shown by Mr. E. Atkinson of that island. Some good examples of such weapons from St. Lucia were also shown by Mr. Rousselet. We hope to be able to give figures of the whole, or at any rate of part of these implements in the next number of this journal, in the first of a series of articles which we propose to publish on stone implements from the West Indies generally.

Perhaps the most justly popular feature in this Exhibition was the table on which the Government Chemist had placed his illustrations of his proposed method of purifying Lamaha water. For the sake of readers outside the colony, it may be as well to record that with the exception of the rain water off the roofs, the only water supplied to Georgetown comes to town through the Lamaha Canal, and that this water is so impregnated with vegetable matter that it has the colour of a weak infusion of tea, nor is it altogether without objectionable smell. For years past, strenuous and expensive efforts have been made to supply the town with more useful water; but at present, and as far

as can be seen the conditions are not likely to be speedily changed, Lamaha water is alone to be had. Now Mr. Francis has discovered that the substance known as 'aluminoferric-cake' purifies this Lamaha water, leaving it colourless and tasteless, at a very trifling expense and in a most thoroughly satisfactory way. And it was therefore not surprising that the aluminoferric-cake, and the Lamaha water purified by its means which he exhibited attracted universal attention and admiration. It is greatly to be hoped that this method of cheaply purifying Lamaha water may be brought into practical and extensive use as soon as may be convenient.*

Turning now to the show of garden produce, we have once more to regret its poverty. Yet owing to the influence of the Botanic Gardens, there is already some improvement in the gardens of Guiana; so that the fruits and flowers and vegetables shown were certainly an improvement on those at previous Exhibitions. And there is every reason for confidence that this improvement will be fostered and increased. It is impossible not to notice the very fine exhibits of plants sent from the Botanic Garden itself; these, in the absence of much else worthy of notice, were in themselves sufficient to make this part of the Exhibition a success.

Live stock was shown in unprecedentedly large quantities; but, if we may trust our own judgment, in quality it

* The cost of aluminoferric-cake is 61/ per ton and this quantity is sufficient to purify over 1,350,000 gallons of Lamaha water. The daily consumption of this water in Georgetown is about 300,000 gallons. A certain quantity of soda ash or other alkali is required in addition to the aluminoferric cake. Altogether, the cost of purifying materials, freight to the colony included, for one day's supply of water is rather less than two pounds sterling.

at least did not exceed that shown on previous occasions.

In conclusion we feel justified in affirming that this second Exhibition was a greater success than the last; and that there is every reason to hope for a corresponding improvement on future occasions. That such opportunities properly used promise large, and almost unlimited benefits to the colony is certain.

A Plea for the Encouragement of the lesser Industries.

By J. S. Blake, Pln. Skeldon.

OWING to peculiar circumstances one industry must always predominate in such a place as this; and to this all others must be more or less subservient. In this colony, it is needless to say, the production and manufacture of sugar is *the* industry of all others. It takes precedence of everything; and everyone is to a certain extent engaged in, or dependent on it. Other industries there are, such as growing cocoa, coffee, cocoanuts and provisions; and much has lately been said and written about the advantage of a mixed cultivation and of other crops on which to rely in case of the failure at any time of a sugar crop or if the depreciation in the price of sugar is ever so great as to make estates unworkable. Without however entering largely into this subject, my intention is to advocate the encouragement of small industries, such as the production of rice and provisions, by people whose spare time, when not engaged on the different estates, is employed in cultivating their own land and provision grounds; and I shall confine myself more particularly to our free immigrant population, East Indian or Chinese.

The cry the other day was—"Give these immigrants grants of land in lieu of back passages to their country.

Do this and they will be contented. Drain their land for them, give them back-dams and kokers, and assist them in every way, and they will be satisfied to remain in their adopted country." This is all very well, but unfortunately the insignificant item *force* which enters into the little plan cannot be understood by Ah-Sim and Ramsammy; and as a consequence the compulsory plan must fail. There is no doubt but that every effort ought to be made to try and induce our free immigrant population to remain in the colony; and, seeing that the cost of their introduction devolves almost entirely on the planters, this effort ought to be directed toward keeping them in the villages and unoccupied lands contiguous to sugar-estates, instead of scattering them up the rivers and in places where they cannot be reached. Thousands of dollars have been spent in subsidies to steamers to open up, it is said, the country, and so to scatter the already too sparse labouring population. Money is being spent on places where the number of square miles perhaps hardly equals the number of inhabitants; and meantime well populated districts contiguous to sugar-estates are utterly neglected. This policy must be utterly condemned. Even liberals in the full acceptation of the term are sufficiently conservative to endeavour to keep that for which they have paid, resisting all effort by others to alienate their property. Yet the effect toward the planters, who are the backbone of the constitution, of the present plan is to remove the dearly bought labour from the coast land and spread it far and wide up the rivers, simply as an experiment—an experiment which may prove disastrous in the end.

Charity, it is said, ought to begin at home. Why not experiment on the people who are buying land of their own accord and settling quietly and contentedly, each man under his own banana? In the Corentyne district, for example, there is a succession of villages from Benab to Skeldon, peopled by East Indian immigrants, Chinese, Negroes and Portuguese, unequalled probably in any other part of the colony. Yet nothing has been done to encourage the inhabitants of the district.

Having had the houses and population between 'Skeldon' and 'Benab' counted, I find that, excluding the two estates 'Eliza and Mary' and 'Skeldon,' the case is as follows:—

		Houses.	Inhabitants.
In 79 Village	...there are...	112	454
78 "	" ...	101	489
75 " or 'Spring Garden'...	" ...	14	64
74 " or 'Balaam'	" ...	29	98
73 " or 'Clonbrook' ...	" ...	23	78
72 'New Ground' or 'Hong Kong'	" ...	30	112
71 'Little Massiah'	" ...	25	90
70 and 69 'Big Massiah'... ...	" ...	62	234
68 " 67 'Carnarvon'	" ...	38	150
65 " 64 'New Market'... ...	" ...	33	122
	Total........................	467	1,891

This population consists of 1,161 free East Indian immigrants, 499 Negroes, 163 Chinese, and 78 Portuguese. Around and behind most, in fact I may say all, of these houses the land is planted with rice, plantains, cassava and other provisions, and industry, thrift, and tidiness are everywhere to be seen, and yet with all this land to cultivate and look after the people still have time to be of considerable service to the adjacent sugar estates.

Taking a week at random, I find that their attendance for work for five days on the two estates 'Skeldon' and 'Eliza and Mary' is Monday, Tuesday, Wednesday, Thursday, and Friday :—

'Skeldon'	43	162	297	331	302
'Eliza & Mary'	104	135	159	97	113
Total...	147	297	456	428	415

The total adult population of East Indian immigrants is 790, and of Chinese 118. This table shews an average of 368 at work per day; so that of the total adult population 40.5 per cent. worked that week. Perhaps, it may be said, "If these people are of so much value to the estates, why do not the latter themselves afford the necessary encouragement?". The answer is that the estates do this as far as possible. Wherever the cultivated land of the villagers borders on the estates, the authorities of the latter afford them drainage, roads, and everything else, not excepting medicine and medical attendance in the Estates Hospitals at times, for nothing. But in the outlying districts surely the Government, the intention having been proclaimed of endeavouring to retain the immigrants in the colony by encouraging their small industries, ought to take the initiative by legislating so as to instil into the by no means dense intellects of the labouring people full trust in their legislation.

The Chinese especially are most industrious. On Lot 72 or Hong Kong, they have a peculiar apparatus such as I have never seen elsewhere for husking and cleaning their rice, of which it seems they have some 100 acres in

cultivation, independent of that owned by East Indians and Negroes. The apparatus in question is in the shape of a conical hat of stone, around and enclosing which is a wicker case of similar shape. The latter is made to revolve by a simple system of ropes and levers. As the rough grain passes between the stone and the casing, the friction produced by the revolution of the latter detaches the husk from the kernel; and the whole is then taken and winnowed. The winnowing separates the bulk of the husk from the grain and the cleaning is completed by pounding the rice in a large sized mortar, the pestle being worked by a long lever which is easily moved by the foot.

The East Indians, who have probably from 200 to 300 acres of rice in cultivation, have been simply using the mortar and pestle for cleaning the grain; but they are now very rapidly adopting the Chinese plan. They evidently seem to appreciate

> "The ways that are dark
> And the tricks that are vain"—

for which the Heathen Chinee is peculiar; and I have no doubt but that in a short time Sammy will be as *au fait* in the matter as his Celestial *confrere*.

The Chinese, it seems, adapt themselves to circumstances. I am told that in the Camoenie Creek, Demerara River, where no stones are to be procured, wallaba shingles are laid within, and the interstices are filled with mud hardened by baking. The ends of the shingles jutting out act as teeth, and considerably facilitate the husking of the rice. With this appliance I believe they can prepare a bag of rice in a very short time.

In contrast to this, it may be mentioned that up the

Berbice river, where the population consists of 'bovianders,' the mode of cleaning rice is so primitive, being by a simple mortar and pestle, that a whole day's work generally only supplies sufficient food for dinner in the evening.

79 Village is drained by 'Skeldon', and 78 by 'Eliza & Mary;' but the other villages from 'Spring Garden' to Benab have little or no drainage. There are a few box kokers here and there, leading to a sand beach on the river; but these are of very little use. In the first place, they are badly put in; and in the second, even if they were properly laid down, sand and mud silt up so much in the dry season that without a comparatively large outlay of money when rain falls, which would press heavily on the inhabitants, they would be useless; and it is a rare thing indeed to see any of them acting.

Not the slightest notice has been taken of this thriving population, and nothing whatever has been done to assist it. The land is at the mercy of bush-water in a heavy season; the nearest dispensary is in New Amsterdam, some 50 miles way; there are no schools except a small hut at Spring Garden; and as I have already said there is no drainage worthy of the name.

I would propose that a draining canal be dug along the road from Spring Garden to the 66 Creek, some 4 miles, and a good koker or sluice put in at the creek. It would be useless to put one in any where else. The one at the creek would never silt up, the bush-water always keeping the channel clear.

A dispensary and school should also be erected in the most central part of the district. If this is done, and

such encouragement is afforded to this and similar districts, it will do more to settle our free immigrant population than could any semi-forcible measures.

Seeing what has been done in the lower part of the coast between 'Seawell' and 'Albion,' it is surely not too much to ask that some one from the Colonial Civil Engineer's Department be sent up to report on the district. I should be glad to give anyone every assistance in my power; but care should be taken not to repeat the error made on the Coast, where during the recent high spring tides the inefficiency of the drainage was indicated in the fact that nearly the whole Coast between 'Seawell' and 'Albion' was flooded by sea water. A scheme carried out in such a manner is useless. Yet thousands of dollars have been spent there, though the population is not one-fourth the number of the inhabitants of the smaller district, which I have described on the upper Corentyne coast.

In conclusion, I again emphatically urge that immediate and united action should be taken to do something for the encouragement of the people of the district last mentioned, and of all similar people, in their small industries. Here there are immigrants from all parts of the colony; their numbers are increasing rapidly day by day, and any encouragement and help they may receive will soon become widely known, will do more to instil trust in our system of Government, and will have more effect in settling them, satisfied, contented and happy, than any other measure that could be adopted.

NOTE.—Since this paper was written some preliminary steps have been taken toward carrying out its suggestions. The Colonial Civil

Engineer, having visited the place has made a chart of the whole district. In conjunction with the author of the above paper he prepared an estimate of the probable cost of putting in the required lock and sluice. The Hon'ble William Russell also prepared a similar estimate; and the two did not differ by more than a few dollars. No further steps have, however been taken. Meanwhile Mr. Blake reports that the number of houses and the population of the district are rapidly increasing, and he estimates them at 20 per cent more than as stated in the above paper.

A Journey up the Cuyuni.

By Michael McTurk.

THREE separate parties of Indians having reported that some Venezuelans were making boats up the Cuyuni, and some Venezuelans having come down that river, and others having been seen in the forest in the neighbourhood of the Penal Settlement, it seemed right that I should ascend the Cuyuni to investigate the state of the inhabitants of the upper reaches of the river. Accordingly I left Kalacoon on the Mazaruni on Thursday 14th October, 1880.

Rain began to fall before we left, and the æta-balli and hackea (*Tecoma* sp.?) trees were budding—a sure sign of the approach of wet weather. Rain continued to fall from the 14th to 18th, the first three days after leaving, and the river commenced to swell, and the downward current to increase so much that we did not reach Warriri, the place where the Gold Mining Company carried on operations some years ago, until Saturday evening. The place is now overgrown with bushes and creepers, but the house still stands, though much out of repair. Here I saw recent tracks of persons wearing boots, who had remained for some time and had slept under the house; there was also a buoy, such as is used for fishing lines, in the river opposite. Shortly after passing Warriri we saw a broken paddle in the water under the bushes and a little further a half-made paddle.

About ½ mile from these was a bark canoe (woodskin) overturned in the water. That evening we camped above the Yeina-ah Falls above which none of us had ever ascended. Before this fall there are two portages, where boats have to be unloaded and hauled over the rocks on rollers. After passing the second of these, the river for some miles is free from any large falls such as require the boats to be unloaded and hauled over, Yanamoo and the Payuco being the largest. The land too, except near the portages, is comparatively low, with a small hill here and there. Above Payuco we had no more rain. The sun was very hot, and either in front or behind nearly all the way; so that when we could do so, we journeyed at night. At mid-day on the 23rd, while hauling up the falls at Wohmopoh we saw some Indians (Acowois), the first we had seen since leaving. They were drying their hammocks and cassava on the rocks, and soon became friendly on my giving them some tobacco. These Indians were from the head of the Urawan; and having been working with the Venezuelans, were now on their way to Georgetown to spend the money they had earned, which was all gold, English, American and Venezuelan.

Although the distance is much greater, these people prefer to go to Georgetown rather than purchase from the Venezuelans at Cayou and Caratal, where they said there were plenty of shops and English people. Everything there is very dear; a flask of powder such as costs 20c. in Georgetown costing 96c. at Cayou, and a cake of cassava, such as costs 8c. in Essequibo, costing 24c. The Venezuelans on the Urawan told me the same. One of the Acawois agreed to turn and go with us as far

as the Urawan. After unloading and hauling over the boats at Wohmopoh (where there is a portage) we remained in camp until Monday morning.

On 26th we came to the first Carib settlement above Timoonie Falls, and shortly after to another on the opposite side, called Koratoka (the cock). On 28th we passed three more Carib settlements, at one of which called Arra-outa (the baboon) the people undertook to make cassava for us by the time we came back At 4 p.m. the same day we first saw the mountains, Akare-coo-tepoo and Anakare-ye-tepoo; and the next day we passed these mountains on our left, as also another called Tirimbandaboo. These mountains are of sand-stone, and are of similar formation to those on the Potaro and in the neighbourhood of Roraima; flat-topped, with precipitous sides, the bare red sand-stone being exposed in many places.

On 24th we passed the last Carib settlement on the Cuyuni. Above, but a long way off, are other settlements of Acawois and Kamaracotas. This last Carib settlement is called Apo-ye-kifoo (the place burnt by fire). On the 3rd at 8 p.m, we entered the Urawan. The Cuyuni and the Urawan are here each 300 yards wide, the latter coming in from about N.E. At 10 a.m. we turned up the Urawan. The water of the creek is white and muddy in appearance, but leaves no sediment after being put to subside. On the 4th at 8 a.m. I could not get the larger boat any further; the whole creek as far as I could see seemed filled by rocks, great boulders of granite, 40 or 50 feet square, with small rills of water running between. There is a considerable fall here in rainy weather called

"Rurreewa." The men carrying the small boat over the rocks, at 11 a.m. we came to water sufficient to float her. From there I went on in the small boat with two men, often having to carry the boat over the rocks for considerable distances. On two of the rocks at Rurreewa, at about the level of the water when the creek is full, were drawings of frogs—several on one rock and one on another. They were about 9 ins. long, and seem to have been made by rubbing on the rock with some harder substance. Many, on the larger rock, had become detached by the scaling of the granite. About a mile above these there is another drawing of a frog on a rock, differing from the others in that it has a line down its centre and another of about four inches long from its mouth upward to the left. The Accawoi Indians call these drawings Parrah-coosa, from Parrah a frog. They knew nothing of their origin, but that they were made many moons since. At 4, p.m., we passed the first Accawoi houses on this creek. One of the Indians here spoke Spanish. The savannah opens down to the creek a little below this place, on the opposite side. On the 5th, at 7 a.m., we saw several Venezuelans camped on the rocks. They civilly enough asked what we had to sell, and eventually begged for some ammunition and tobacco. About a mile farther we came to a landing apparently of some importance. The path leads from this over the savannah to Cayou, which is the nearest Venezuelan town or village. About a mile from the landing along the path is the nearest house, FRANCISCO'S. It is a two days' journey over the savannah along this path to Cayou. From Francisco the savannah

is open and undulating, with clumps of tree several acres in extent here and there; and where the grass had not been burnt off it was over six feet high and excellent as pasture. The many Venezuelan houses scattered here and there on the savannah were very similar in structure and material to those of Indians, but that some were partly enclosed, the rough doors and windows being of raw deer-skins. The people who inhabit these houses seem to be of the same class as the squatters on our own rivers, and are of mixed Indian and Spanish blood. I saw neither white men nor negroes, though one or two had mulatto hair. They live like Indians, by cultivating cassava and plantains, or by grazing a few cattle or mining for gold at Caratal and in the neighbourhood. They use donkeys to carry their cassava and firewood from their fields to their houses. The Accawoi Indians work with these Venezuelans, and are paid wages up to 27 dollars per month; but they say they are often beaten by their masters without redress. The Caribs will not work in this way; but I was told that during the revolutions they take wages to fight for either or both factions, there being an understanding among them that they are not to injure their own countrymen if possible, but to kill the opposing Venezuelans. From the Caribs I learned that a number of Spaniards had come down the Urawan in canoes taken from the Indians, and had taken away the guns of the men living above Arraouta; they had also dug up and taken away the cassava. From the appearance of the fields, the robbery appeared to have been committed about three months previously. At Koratoka the cassava had also been stolen, but not to such an extent as at

Arraouta. Most of the Venezuelans went back up the Urawan, but some came down to Timmoonie and got the Caribs there to make cassava bread for them, promising payment, but took it away after it had been baked, threatening to beat the Indians when they remonstrated. The Caribs say they were too few to resist the Spaniards, who moreover had taken away their guns. These occurrences were I think the origin of the reports I had heard, and the Spaniards seen near the Settlement were those who came down from Timmoonie; and these probably made their way back to Venezuelan territory by way of Morooca and Trinidad.

The land up the Cuyuni seems lower than that on the Essequibo and Mazzaruni, but is more fertile, there not being so much sand in it, so that grass springs up wherever a large tree falls or a small clearing is made. The forest trees too above Payuco Fall are different. I saw no greenheart or souari-nut trees above that fall, but quantities of long-john, silk-cotton and hog-plum trees. Bamboo grew all along the side of the river from from above Payuco to the mouth of the Urawan. From Apo-ye-kifoo upwards, the forest for miles on both banks of the river and for considerable distance inland had been burnt. The Indians say such fires occur spontaneously, and burn until stopped by the rains or some large creek.

I left FRANCISCO'S on the afternoon of the 5th, and called at Arraouta for the promised cassava. No occurrence of note happened until the 15th, when we nearly lost one of our boats while lowering it over a large fall. The rocks were very slippery; and

one of the men fell just as the boat was going over, the jerk throwing most of the others down, which caused a sudden strain on the rope, burying the bow of the boat in the fall, so that it immediately filled and was carried away. Luckily there were no rocks, or it would have been broken into small pieces. The load had been taken out and carried across, so fortunately we lost nothing but the time taken to bale.

The rain recommenced on the 14th and fell continuously, so that the river rose about four inches during the night of 16th.

We ran the last of the falls at 8 p.m. on the 18th, and arrived at Kalacoon without further incident at 10.30, a.m., having been exactly five weeks away.

Food in Relation to Work.

By Frederic I. Scard, F.C.S.

IT is now forty years ago that GROVE, by the enunciation of the great principle of the "correlation of the natural forces" marked an epoch in the advance of science. Prior to that date, the views held by scientists with regard to the relative positions of the so-called "forces" were vague and unsatisfactory. Heat, light, magnetism, electricity, etc., were considered to possess distinct features and idiosyncratic properties, and more especially what was then termed "vital force" was considered to be independent of, and to possess no analogy to the others. The operations of the animal system, indeed, were looked upon as admitting of no explanation apart from the mysterious influence of life; and it may be said that the views of physiology were but slightly advanced since the time when, side by side with the transmutation of metals and the philosopher's stone, the "elixir of life" formed such a prominent object of research among the philosophers of the middle ages.

GROVE'S doctrine may be briefly summed up in his own words, "that any force capable of producing another may in its turn be produced by it," or, otherwise expressed, that all the different forms of "energy"—heat, light, electricity, magnetism, chemical affinity, motion, etc., are mutually convertible, any one being capable of yielding its equivalent quantity of another.

The bearing of this doctrine upon physiology was at once apparent. "Vital force" no longer stood out alone and distinct, but could be regarded as forming one of the family of "energies" and, therefore, capable of producing and being produced by any one of the other forms.

The first views of any importance on the subject of the relationship of food to work were those of LIEBIG. Coming from the pen of the first chemist of the day, they may be said to have been universally received throughout the scientific world. LIEBIG divided foods into two classes, the *nitrogenous*, or those containing nitrogen, and the *non-nitrogenous*, or those which consisted only of carbon, hydrogen, and oxygen. The former class he termed "plastic," and attributed to them the functions of supplying the materials for the production of muscular and nervous force. To the other class he applied the title of "heat producers," or "calorifacient."

Looked at in this light, the principal part of nutrition would be played by nitrogenous food. Not only would nitrogenous food, as LIEBIG imagined, renew the tissues, but it would also indirectly form the source of muscular work, since this latter form of energy would according to LIEBIG, be due to the transformation of the stored-up chemical energy of the tissues consequent on their oxidation and destruction within the system.

Attractive and plausible though this theory was, as the test of experimental research came to be applied to it, doubts arose as to its validity. Were the tissues by their oxidation and destruction the source of muscular power, increased work would mean increased destruc-

tion of tissue. Increased destruction would necesssitate increased elimination of nitrogen in the excretions, since nitrogen plays such a prominent part in the composition of muscular tissue; and consequently the amount of eliminated nitrogen would be directly related to the amount of work done.

Proceeding on these lines, numerous observers submitted LIEBIG'S theory to the test of experiment; but the first decisive blow was struck by two German scientists, FICK and WISLICENUS, the one professor of physiology and the other of chemistry at Zurich. Their mode of procedure was to observe the elimination of nitrogen under ordinary condition as regards work, but under a strictly non-nitrogenous diet. Severe muscular work was then to be undertaken, still under a non-nitrogenous diet, and the elimination of nitrogen again watched.

By these means, if the source of muscular powers consisted in the destruction of the muscles *themselves* the amount of nitrogen egested during the "work" period ought to be greatly increased.

The work chosen to be performed was the ascent of the Faulhorn, a mountain in the Bernese Oberland, between 6,000 and 7,000 feet in height. The day previous to the ascent was passed on a purely non-nitrogenous diet, and from the time of the cessation of nitrogenous diet, the eliminated nitrogen was observed to undergo a decided and progressive diminution. The next day, on a similar diet, the ascent was effected. *No increase was observed during this period in the amount of eliminated nitrogen.* On the evening of the day of the ascent, after a brief interval of rest nitrogenous food

was again taken. *The egested nitrogen now commenced to increase in quantity.*

Apart from any consideration of the relation of the amount of work actually done to the dynamical equivalent of the tissue supposed, according to LIEBIG'S view, to be consumed, these observations shewed, in a most pronounced manner, that the elimination of nitrogen depended upon the nitrogenous food consumed rather than upon the amount of work done. But when the amount of work done is taken into account and placed against the work-value of the tissue which, on LIEBIG'S hypothesis, would be represented by the amount of nitrogen eliminated, the results afford still more striking evidence of the fallacious character of LIEBIG'S theory.

Shortly after the publication of the doctrine of the correlation of the natural forces, JOULE, of Manchester, arrived at a definite expression for the relationship of "heat" and "work." This expression he termed the "mechanical equivalent of heat," and gave 1390 foot-pounds as the "work" corresponding to a unit of heat, or, in other words, that the work done in raising 1 lb. 1390 feet, or 1390lbs. 1 foot, would, if otherwise applied, produce sufficient heat to raise the temperature of one lb. of water one degree centigrade.

In addition, Professor FRANKLIN by completely oxidising albuminous matters (which form the basis of muscular tissue) has obtained an expression for the number of units of heat evolved in the process. The albuminous matters in the system, however, do not undergo complete oxidation; a product resulting which is susceptible of further oxidation. Thus the number of the units of heat

resulting from complete oxidation would be above that from mere destruction within the body. The composition of the remaining product being, however, known, a correction can be made in the experimental figures, and an approximately correct expression obtained for the units of heat generated by the combustion within the body of a given weight of muscular tissue.

Applying these data to the observations of Messrs. FICK and WISLICENUS the work-value of the nitrogen eliminated is easily calculated, on the supposition that this nitrogen represents so much destroyed tissue. The other side of the question, viz., the amount of work actually done, is simply the weights of the two observers raised to the height to which they ascended; and, as in the case of the work-value of the tissue substance, is readily expressed in foot-pounds.

Proceeding thus, it was found that the work equivalent to the eliminated nitrogen, *on the supposition that the nitrogen was yielded by the destruction of muscular tissue,* formed but a small fraction of that actually performed.

Numerous observers have repeated the above experiments with various modifications. The most notable of these was PARKES, who, in observations conducted on soldiers, confirmed in the main the results of FICK and WISLICENUS. Dr. AUSTIN FLINT, it is true, who adopted for his subject of experiment a celebrated American pedestrian, WESTON, arrived at somewhat different conclusions, but the figures yielded in his observations admitted of being interpreted both ways; and a subsequent series of investigations by PAVY on the same

individual, of longer duration and more complete and searching in their character, clearly established that, though some increase of egested nitrogen did occur during the period of work, it was due to increased nitrogenous food, the small excess of egested over ingested nitrogen which was noticed simply representing the additional wear of the tissues in converting the *chemical energy* of the food into *potential energy*.

There is thus an exact analogy between the operation of the animal system and that of a machine. In the one the fuel supplies the source of power, in the other the food. In the working of a machine a certain amount of wear goes on, necessitating renewal and repair. With the animal system a certain amount of tissue-waste requires renovation, this waste being dependent on the amount of work done in converting the force capability of the food into the manifestation of muscular power.

In preparing, then, a dietary adapted for work, the following points have to be attended to :—

1stly. That there should exist in the food sufficient force-value to yield the amount of work to be undertaken.

2ndly. That sufficient nitrogenous food should be included, so as to supply material not only for the renewal of the *normal* tissue waste, but also for the compensation of the increased tissue wear and tear.

3rdly. That the food chosen should be of such a nature that, while possessing as much force-value as possible, it should be easily digested and assimilated, and thus diminish the tax upon the system.

As agents for supplying muscular power the non-nitrogenous foods are especially adapted. The ultimate oxidation products of all these are carbonic-acid gas and water, substances easily eliminated from the system; and as complete oxidation occurs with these bodies under physiological conditions, their full force value is obtained. In addition they possess, as a rule, the ad-

vantage of being readily digested and assimilated. Nitrogenous matters, on the other hand, do not undergo complete oxidation in the system, and their full force value is accordingly not manifested. A residual body is formed which taxes the animal powers to some extent to eliminate, while at the commencement extensive digestive action has to be brought into play to render them capable of absorption in the alimentary canal.

The alimentary principles may be classed under three heads, the albuminous bodies, fats, carbo-hydrates (starches, sugars, etc.) The force-values of these have been determined by FRANKLAND by calculation from the number of units of heat given off during combustion with oxygen. Expressed in foot-pounds they are as follows:

Mechanical work equivalent to the oxidation within the system of 1 oz.

		Foot-pounds.
	Albumen	... 418,925
	Fat (animal)	... 785,117
Carbo-hydrate.	Starch	... 339,119
	Cane sugar	... 290,188
	Grape sugar	... 284,075

It is thus seen that the fats possess by far the greatest dynamic value, and, did they offer the same facilities for digestion that the carbo-hydrates do, would form by far the most ecomomical food for the production of muscular power. Unfortunately, the capacity for the digestion of fat exists but to a limited extent, and the digestive troubles which generally supervene on a diet in which fat forms a prominent feature preclude its adoption, save to a small degree, as an article of diet.

As has been mentioned before, albuminous matters such as meat, eggs, etc., tax the system to a considerable extent as regards digestion and the elimination of

the waste products; and, though they are seen above to possess considerable force-value, are not to be compared with the carbo-hydrates as dynamical agents. These latter are especially easy of digestion, and owing to their universality of occurrence and cheapness, form the diet most convenient for the performance of severe exertion.

The figures given above represent the force-value of the principles in their pure form. Professor FRANKLAND has also determined the force-value of various articles of food in which they occur. A great number of them contain a considerable quantity of water, which of course, weight for weight, militates against their force-value.

Force-value of 1 oz. of various articles of food.

NAME OF FOOD.	Force-Value in foot-pounds.	NAME OF FOOD.	Force-Value in foot-pounds.
1. *Fats*		Grape sugar ...	284156
Cod-liver oil ...	789400	Bread crumb ...	186240
Beef fat ...	786100	Potatoes ...	86366
Butter... ...	629738		
		3. *Nitrogenous.*	
2. *Mixed but principally carbo-hydrates.*		Cheese... ...	377802
		Yolk of egg ...	286524
Oat-meal... ...	340759	White of egg ...	49937
Flour	332572	Ham	145513
Pea-meal ...	327046	Beef	122614
Arrowroot ...	340122	Veal	101511
Ground rice ...	325614	Mackerel ...	139782
Cane sugar ...	290207	Whiting ...	68571

These figures give the *total* force-value, but it must be remembered that wherever thermal energy is transformed into potential, in other words, wherever power is derived from heat, an enormous loss occurs. The more perfect the machine, the more complete is the transformation of the heat into work; but even in so perfect a

machine as the animal system, HELMHOLTZ calculates that but *one-fifth* of the force-value of the food is really obtained in the form of work. The radiation, conduction etc., from the surface of the body, and an infinity of smaller causes effect the loss, as far as power is concerned, of the remaining four-fifths.

FRANKLAND, by taking the force-value of the various articles mentioned above, and calculating on HELMHOLTZ' statement that one-fifth of the force-value is actually obtained, has represented in a tabular form the weight and cost of a sufficient quantity of the respective materials to raise the body of a person weighing 140 lbs. to a height of 20,000 feet (about equivalent to the same individual walking 20 miles on level ground). These he gives as follows :—

NAME OF FOOD.	WEIGHT REQUIRED in lbs.	PRICE Per lb.		COST.	
		S.	D.	S.	D.
Codliver oil	0.553	3	6	1	11¼
Beef fat	0.555	0	10	0	5½
Butter	0.693	1	6	1	0½
Oat-meal	1.281	0	2¾	0	3½
Flour	1.311	0	2¾	0	3¾
Pea-meal	1.335	0	3¼	0	4½
Arrowroot	1.287	1	0	1	3½
Ground rice	1 341	0	4	0	5½
Cane sugar	1.505	0	6	0	9
Grape sugar	1.537	0	3½	0	5½
Bread crumb... ...	2.345	0	2	0	4¾
Potatoes	5.068	0	1	0	5¼
Cheese	1.156	0	10	0	11½
Hard boiled eggs ...	2.209	0	6½	1	2½
White of egg	8.745	0	6	4	4½
Ham	3.001	1	6	4	6
Beef	3.532	1	0	3	6½
Veal	4.300	1	0	4	3½
Mackerel	3.124	0	8	2	1
Whiting	6.369	1	4	9	4

Besides the supply of suitable food for the production of muscular *power*, it must be remembered that provision has to be made for muscular *maintenance*. During rest, or comparative rest, the elimination of nitrogen amounts to from 150 to 200 grains *per diem*. This quantity may be said to represent the tissue destruction going on normally in the body. During work this amount would be somewhat increased by the increased wear of the tissues. Allowing an additional 50 grains for this would bring up the nitrogen to be supplied in the form of food to, say 275 grains; and no form is so good for the administration of this nitrogen as meat. This amount of nitrogen would be yielded by about 14 oz. of lean beef, but it must be remembered that even were a carbo-hydrate chosen to yield the force-value a certain amount of nitrogen would be ingested therein, and thus a smaller quantity of meat would suffice.

By adaptation of the above principles means are afforded for comparing the relative economy of manual and machine labour. I have stated that it is calculated that with man about one-fifth only of the dynamic value of the food is utilisable for work. With a steam-engine constructed on the most approved principles, only one-tenth of the force-value of the fuel is obtained. Were then the cost of food anywhere near the cost of fuel, man would be the cheaper engine for work. But between the cost of food and that of fuel, there is an enormous difference, and it is this difference which gives rise to the economy of machine labour.

Much discussion has taken place lately on the position which alcohol holds in relation to food. Calculated from

its thermal value when oxidised, its force-value would be very high, and, as it is now generally conceded that it *is consumed* in the system, alcohol should take a prominent place in a labour dietary. It is, however, universally known that, after the immediate temporary stimulation, the ingestion of alcohol is almost fatal to the continuance of muscular labour. The explanation of this apparent anomaly is to be found in the physiological action of this principle upon the nerves, relaxing their tension and, if taken to excess, producing a species of temporary paralysis. The proper position of alcohol as far as work is concerned is as a sedative *after the work is over*, and not as an agent for the production of energy.

Occasional Notes.

West Indian Folk-lore.—The following notes on certain quaint customs and popular beliefs in the West Indies have been jotted down at odd times by Mr. G. H. HAWTAYNE:—

A relaxed throat is always attributed to the falling down of the palate. A popular corrective is to tie up the hair in a plait on top of the head so as to prevent this falling. A headache, if supposed to be caused by exposure to the sun, is generally treated by placing a bottle of water on the head and standing exposed to the full rays of the offending orb. The patient is recommended to remain until the water boils, but the popular belief is that the heat which is the cause of the complaint passes up into the water.

A woman who is *enciente* will not willingly step over a stick or rod laid across her path.

The moon is popularly supposed to exercise its influence in a great variety of cases: I have been warned of the futility of fishing for mullet in a mountain stream after a moonlit night, "You see, Massa, de fish and dem "does git up all night fo' fill dey belly and dey no' "hungry day time." Fish caught when the moon is bright do not keep long and are sold cheap. Roots, such as yams, sweet potatoes, &c., should be planted on a dark night at the last quarter of the moon; otherwise the increasing moon causes the vine to "run after it," and few roots will be the result. A large return of maize (Indian Corn) is ensured by planting when there

are many stars in the sky and the seed is sown by a lady in an interesting condition. Wood and bamboo cut when the moon is at, or is approaching, the full is sure to become worm-eaten and useless. "Jack Spaniards," marabuntas, wasps, all sting more venomously when the moon is full. Sleeping in the moon will twist your face, and it is common to see old women going to, or returning from chapel on a bright moonlight night with their umbrellas up. When the horns of the moon are upward so as to form a boat, dry weather will follow, when canted, or reversed rain may be expected. When calabashes fall off a tree before reaching their full size it is well to drive an iron spike or a horse shoe into the trunk of the tree.

There are times when a woman picking oranges turns them sour. "My gun does not carry straight, "I expect my wife handled it to-day," is a remark sometimes heard.

If one wants to see "jumbies" "duppies" ghosts, all that is necessary is to put in your eye the tears from the eyes of a pie-bald horse. It is no use explaining to a negro that what he has taken to be a "jumbie" or apparition, is a tree or rock or other natural object. He at once explains that a jumbie is able to assume these shapes to escape detection. Among other old English terms which though not in use in England, survive amongst negroes, I have heard the term *rounce* used as an insulting word. It signifies an apparition capable of change

A black person will not eat any food except such as he believes was eaten by his father.

Derivation of the word Boviander.—This word is one

of many occurring in Guiana worthy of examination. It is applied to the people of very mixed race, partly European, partly African, partly American Indian, who have squatted, and made their homes some distance up the rivers, at a point higher than that cultivated or occupied by Europeans or negroes. The occupation of these people is of the very easiest. They catch fish, they hunt, perhaps, if they are very industrious, they cultivate a few plantains or yams; for the rest, their occupation in life is to lie in their hammocks. It would seem, however, that on savannahs of the Berbice River some few of them tend a few head of cattle; but such industry is very exceptional. But what is the meaning of the name boviander? Mr. J. S. BLAKE writes that "it is not, as the name would imply, derived from bos, bovis, an ox, which one would naturally conclude from the swelling savannahs and pastures of the upper river on which these people reside but where oxen are *not*. I believe the name arose in the old times; when any one on his way up the river called at a house in the comparatively lower portion, and asked for some friend, the answer was "He no here, he ''bove yander'" (above yonder), meaning further up the river; hence the name given to the people living in the upper districts, 'Bovianders'" Another friend, himself a Dutchman, assured me that it is from the Dutch word *Bovenlander*,—a highlander or man from the upper regions. There being so many words evidently of Dutch origin incorporated in the creole patois, it would be dangerous to assert that the latter derivation is improbable; but the former is certainly the more picturesque.

New Plants from Guiana.—As was to be expected, now that our Botanic Gardens have been fairly advanced and that the Government Botanist is enabled to devote a certain part of each year to travelling in the interior, the number of new plants from Guiana introduced into English cultivation is increasing. A few of these we propose to notice here.

In 1880 imperfect specimens of a remarkable agave-like plant from the Kaieteur savannah on the Potaro River were taken to Kew by Mr. IM THURN, where, by reason of their imperfection, they were supposed by Mr. J. G. BAKER to represent a new species of *Cordyline*, which was accordingly described and figured in the *Gardener's Chronicle* vol. xiv, p. 241 as *C. micrantha* nov. sp. But Mr. G. S. JENMAN having recently procured and sent to Kew some much finer specimens of this plant than those previously deposited, it has been found that, as Mr. N. E. BROWN writes from Kew:—

"It turns out to be, not a *Cordyline* at all, and does not even belong to the order *Liliaceæ*, but to the *Bromeliaceæ*, and is thought to belong to the little known genus *Brocchinia*; it will, I believe, shortly be fully described by Mr. Baker, under the name of *Brocchinia cordylinoides*, along with another new Bromeliad contained in the collection. This fine arborescent Bromeliad is represented in the foreground of the illustration that accompanies the description on p. 241 of the volume of the *Gardener's Chronicle* above quoted. It appears to be confined to the savannah above the Kaieteur Fall in the Potaro river, and is itself inhabited by another very handsome and interesting plant, viz., *Utricularia Humboldtii* which finds a home in the water held in the axils of the leaves of the Bromeliad. Mr. Jenman states on the label sent with the *Utricularia* that it is "aquatic, confined to the water contained in the axils of the leaves of *Cordyline micrantha*, which is always copious. The stems rise up and flower above the leaves of the *Cordyline*. Very common. It appears to be strictly confined to the *Cordyline* [*Brocchinia*]."

If the Bromeliad—together with its dependent the *Utricularia*—could be successfully introduced into cultivation, they would form very striking and interesting objects. *Utricularia Humboldtii* is very different in appearance from either *U. montana* or *U. Endresii*, and is one of the finest species of the genus; the petioles of its leaves are from 1½ to 2 feet long; the leaf-blade is cuneate-reneform in outline, and from 2 to 5 inches broad; the flower-stem apparently grows to about 3 feet in height, and the flowers are about 1½ in diameter.

Mr. Jenman's remark, that it appears to be strictly confined to the Bromeliad, may be correct, so far as that region is concerned; but Schomburgk, who discovered *Utricularia Humboldtii*, states in his *Reisen in Britisch Guiana*, p. 1086, that he collected it on the southern declivity of Roraima at an altitude of 6000 feet, growing in boggy grassy places along with *Heliamphora*, *Cypripedium*, &c."

To these remarks on the locality of the *Utricularia*, we may add that the plant, with the *Heliamphora*, *Cypripedium*, &c. was gathered only last year, at the very place where Schomburg gathered it forty years ago.

As an instance of how some of our common things are unknown, and therefore welcome to botanists and horticulturalists at home, it may be mentioned that the late Curator of the Museum carried with him to England in 1879, some tubers of the Aroid well known here under the name of Labaria-bush, owing this name to the fact that the leaf-stems are marked somewhat as is the skin of the Labarria snake [*Trigonocephalus atox*]. The plant has attracted much attention at Kew, where it has recently flowered and been welcomed as of a new and remarkable species. So that our old creole friend is about to receive its scientific baptism at home.

Locust Gum.—There is at present a large demand for this article, to which we have already made reference, and orders for large quantities for commercial pur-

poses, have been received by almost every merchant in the colony, one having even received a single order for 300 tons to be delivered within a year. In consequence of this demand it is no uncommon thing for men thrown out of other employment, especially overseers, to run away into the bush in the hope of making, at least, a livelihood and perhaps, a fortune by collecting this much desired article. It may, therefore, be as well to say, that the gum exists only in very limited quantities and in scattered districts; that it is extremely improbable that 300, or even 30 tons have been, or could have been collected from the day when for the first time this gum was sold in Guiana; and that as the comparatively small quantity which is now being found is certainly the product of an indefinitely long period when its value was unknown, and its growth must be extremely slow, it is certain that the small supply will soon be exhausted. Therefore we offer advice: to collectors here, that they should not build many or large castles of locust gum in the air; and to buyers outside the colony, that they should hope neither for any considerable increase in the quantity above that now obtainable, nor should they expect even this limited supply to be of long duration.

Laurite, a new Sugar.—The following account of this substance is taken from the official Report for 1881, of Mr. E. E. H. FRANCIS, F.C.S., our Government Analytical Chemist:—

"A complete investigation is also being made into the nature and properties of a new sugar or saccharoid yielded by the avocado-pear tree, isomeric with mannite, and discovered by me a short time before leaving Trinidad for this colony. This substance, which I have provisionally named Laurite, has the same composition as mannite, the sugar of

manna, and of dulcite, a rare sugar occurring in plants of the order *Scrophulariaceæ*. Laurite closely resembles dulcite in taste, solubility, melting point and specific gravity, but is essentially different from it in the shape and system of its crystallisation and in not yielding mucic acid on being heated with dilute nitric acid. On the other hand, in crystalline form the substance is like mannite, but greatly differs from it, nevertheless, in its degree of sweetness, higher melting point, inferior solubility in alcohol and dissimilar behaviour under the action of hydriodic acid. Laurite occurs in all parts of the avocado-pear tree, but is yielded most easily by the bark. To obtain it, the bark is broken into small pieces or coarsely ground and boiled with water. The decoction is strained and precipitated with acetate of lead, filtered, and the excess of lead in the filtrate removed with sulphuretted hydrogen or sulphurous acid, again filtered, and the filtrate boiled down to a syrup, when it sets to a semi-solid mass of minute crystals on standing for some hours. It is then transferred to a beaker and boiled with methylated spirit, which dissolves very little of the laurite but removes glucose and colouring matter. The solid residue, consisting of impure laurite, is collected on a filter, pressed and recrystallised several times from water, or better from spirit of 40 over proof. Finally, the laurite may be prepared in a high state of purity by being recrystallized in small quantities from rectified spirit. It is thus obtained in the form of small transparent needles that often form stars and, when collected and dried, resemble sulphate of quinine in bulk and lightness, and are quite different from the lustrous crystalline grains of dulcite similarly obtained. Laurite also crystallises from alcohol in a very different manner from mannite; a saturated solution of mannite in boiling alcohol becomes on cooling a pulpy mass of long fibrous crystals, and the vessel containing it may be inverted without any of the alcohol flowing out, whereas a saturated solution of laurite in boiling alcohol deposits only a slight flocculent layer of short needles, and nearly all the alcohol can be readily decanted.

When laurite is crystallised from water it is deposited as a white powder, the crystalline nature of which is only apparent under the microscope. In this respect therefore it exhibits a marked difference from both mannite and dulcite, each of which readily yields crystals of considerable size from the aqueous solution. The crystals of laurite have the same shape whether obtained from alcohol or water, those

yielded by alcohol, however, being by far the larger. They consist of short needles and plates with square ends, evidently belonging to the trimetric system. As already mentioned laurite resembles mannite in crystalline form but is quite unlike dulcite which crystallises in monoclinic prisms with octohedral summits. Laurite exhibits the same general properties which characterise dulcite and mannite. It melts and partially sublimes when heated in a tube, dissolves in sulphuric acid without blackening and is not altered by caustic alkali solution. It is freely soluble in water, sparingly soluble in strong spirit, insoluble in ether and chloroform. It forms a blue solution with a mixture of copper sulphate and potash, but does not reduce it on boiling. It precipitates neither normal nor basic acetate of lead, but forms a bulky white precipitate with ammoniacal acetate of lead. The crystals slightly polarize light but, probably in consequence of the smallness of the crystals, not nearly so powerfully as either mannite or dulcite. Laurite is slightly sweet in taste and to a degree about equal to dulcite. The ultimate analysis of laurite gave numbers fairly agreeing with the formula $C_6 H_{14} O$ Laurite dissolves with effervescence in heated dilute nitric acid but does not form mucic acid like dulcite. Saccharine acid is probably produced however. Laurite is very non-hygroscopic and bears a considerable degree of heat without being sensibly altered. It did not lose weight in the hot air bath very appreciably until the temperature rose above 210 degs. c. Heated in a narrow tube in a paraffin bath no particular decomposition was observable until the temperature reached 280—290 degs. c., when darkening and evolution of gas set in. Laurite melts when heated. Its melting point and that of both mannite and dulcite were carefully determined. Preliminary experiments had shown that the melting point of laurite was much higher than that of mannite but closely approached, if it was not identical with that of dulcite. But the melting points of both dulcite and mannite recorded by different observers varied so much that their careful redetermination became necessary.

The following are the corrected melting points of three specimens of mannite, five of laurite and two of dulcite :—

Mannite 166·62 degs., 166·65 degs., 166·67 degs., 166·58 degs., 166·52 degs., 166·56 degs.

Mean melting point = 166·60 degs. c.

Laurite 186·64 degs., 186·72 degs., 186·87 degs., 186·60 degs , 186·63 degs.

Mean melting point = 186·69 degs. c.

Dulcite 187·26 degs., 187·17 degs., 187·54 degs.

Mean melting point = 187·32 degs. c.

The first three determinations of melting point were made with laurite that had been simply recrystallised from water until judged to be pure; but the fourth was made on a specimen that had been submitted to such treatment as would remove, or at any rate alter, any impurity that might have eluded the ordinary method of purification.

The treatment was as follows:—a portion of laurite already apparently pure was re-crystallized from hot 10 per cent. caustic soda solution, collected and re-crystallised from 20 per cent. sulphuric acid (20 parts oil of vitriol 80 parts water), collected, pressed, washed with alcohol, dissolved in water and converted into lead compound with ammoniacal acetate of lead. The lead compound was well washed with boiling water, suspended in water decomposed by sulphuretted hydrogen, and the solution filtered. The solution was evaporated to dryness and the residue crystallised from rectified spirit. The crystalline form of this highly refined product was now found to be exactly the same as before the purification and the melting point being 186.60 degrees closely approximated to the other determinations. It is therefore considered that the result of this experiment fairly proves that laurite is a distinct substance and is not merely dulcite with its crystalline form modified by some impurity nor mannite with the melting point raised by a similar cause.

The specific gravity of laurite and also of mannite and dulcite were determined by weighing the substances in sulphuric ether at the ordinary temperature. No mention appears to be made of the specific gravity of mannite in the reference books; but Gmelin's Hand-book of Chemistry states, apparently on the authority of Eichler, that melampyrite (synonym for dulcite) has a specific gravity of 1.446 at 15 degs. c. In some specific gravity determinations of solid organic bodies that have been recently published (*Journ. Chem. Soc.* Abstracts, 1879, p. 610) A. Schroder gives the specific gravity of mannite as 1,489. However, careful determinations gave the following results:—

Mannite		Laurite		Dulcite	
Temp. c.	Sp. Gr.	Temp. c.	Sp. Gr.	Temp. c	Sp. Gr
26·0 degs.	1·488	26·5 degs.	1·503	26·0 degs.	1·500.
26·0 „	1·488	26·8 „	1·509	26·7 „	1·505.

A 50 gramme Regnauld's specific gravity bottle was used and the

powdered substances were placed in it, covered with ether and shaken well at intervals for about sixteen hours before being weighed.

The solubility of laurite, dulcite and mannite in rectified spirit was also determined. The spirit used contained 86·6 per cent. of alcohol by weight. One gramme of each of the finely powdered substances in 100 c. c. of spirit, placed in a corked flask, was heated in a water bath and then set aside to cool, filtered from deposited crystals through glass "wool," and, after standing for ten days, measured quantities of the clear filtrate were evaporated at a temperature below ebullition, and the residue weighed.

1 part of dulcite	was	contained	in	2041	alcohol
1 „ „ laurite	„	„	„	1928	„
1 „ „ mannite	„	„	„	439	„

Erlenmyer and Wanklyn have shown that both mannite and dulcite yielded hexyliodide when distilled with strong hydriodic acid in a current of carbon dioxide gas. Two attempts to produce the same substance from laurite have failed, although no difficulty was experienced in obtaining it from either mannite or dulcite. By their yielding hexyl-iodide it was proved that mannite and dulcite were really hexatomic alcohols, and in accordance with modern chemical terminology their names have been changed respectively to mannitol and dulcitol. The failure of laurite to re-act in the same way prevents it at present from being classed as an alcohol, and from receiving the rather euphonious name of lauritol.

Laurite forms a barium-compound when one equivalent of laurite and two of barium hydrate are heated together with a sufficient quantity of water. This compound is very soluble, and can only occasionally be induced to crystallise. When its solution is allowed to evaporate spontaneously under a dessicator it, as a rule, slowly becomes a viscid syrup, and at last dries up to a semi-transparent paraffin-like looking mass that gradually becomes white and opaque. When the solution does happen to crystallise, however, the crystals grow to a large size and perfect form. The analysis of this compound is not yet completed. Other compounds and derivatives of laurite are being investigated. Much delay in completing these researches is due to the difficulty of getting avocado-pear bark in this colony; but a quantity of about 500 pounds of bark has just been received from Grenada, and will doubtless furnish sufficient of the sugar for the study of its more prominent properties.

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Report of the Meetings of the Society.

Meeting held 12th January.– The Honourable W. Russell, Vice-President in the Chair.

There were 14 members present.

Elections.—*Members:* C. H. G. Legge, F. Eustace King, W. F. Dadson, H. R. W. Greig.

Associates: J R. D. Hill, H. T. Perkins, Thomas St. F. Daly, E. E. P. Austin.

The Vice-President said that he had to notify the re-appointment of Mr. E. F. im Thurn, as curator of the Museum and secretary to the Committee of Correspondence of the Society. With respect to Mr. im Thurn's qualifications for the post he need not say anything, as that gentleman was so well-known to every member of the Society. He could not but think that the Society ought to feel flattered at the kind way in which the Government had come forward to aid the Society in finding the fund for this appointment; and the Governor had not only agreed to put the money on the estimate for the Combined Court, but had expressed himself in the highest terms as agreeing with the action of the Society. He could only say that he thought it devolved upon the members of the Society to show themselves worthy of the confidence placed in them by the Government.

The following letter from the curator on the subject

of the Museum was read :—

British Guiana Museum,
2nd January, 1882.

To W. H. CAMPBELL, Esq.,
Chairman of the Committee of Correspondence.

SIR,—In resuming charge of the Museum, there are several points, which I wish to lay before the Committee of Correspondence.

1st. Concerning the catalogue of the Museum. When I was last in charge of the Museum, I drew up a catalogue which I took home with me, to be printed after various specimens which went home with me should have been named and inserted in the list. There having been much unavoidable delay in the naming of these specimens, which I have now brought back to the colony, the catalogue was not in the printers' hands when it became apparent that I should probably return to this colony. Taking, therefore, into consideration that many changes, affecting the correctness of the catalogue, had probably taken place in the Museum during my absence, and that my ideas of the best arrangement of a Colonial Museum had been so much altered by what I had seen in England that I should probably re-arrange the contents of the British Guiana Museum if it were again given into my charge, I thought it best to bring the catalogue back with me in MS., and to endeavour to obtain your permission to print it in the colony, merely roughly and with such alterations as the lapse of time has made absolutely necessary, in order that this rough catalogue may serve as a hand list to be used in the gradual preparation of a complete and full catalogue, which may be printed either at home or here, as circumstances may direct. I have now, therefore to ask your consent to this arrangement.

2nd. Having referred in the previous paragraph to the fact that my ideas of the best arrangement of a Colonial Museum have been altered by my recent experiences in England, I have now to explain what my present views are. When I was last in the colony I divided the contents of the museum into a colonial and an extra-colonial collection : and I am still fully pursuaded that that arrangement is most desirable. But, whereas I before aimed at the exhibition in glass cases of as nearly complete a collection of colonial products as possible, I now wish to exhibit only a typical collection of these products, and to keep a more complete collection in drawers for the use of those who really wish to study. I have been led to this conclusion by the facts (1st) it is im-

possible in this climate, and with the means at our disposal, to keep a large collection in order in cases which are open to the inspection of the general public; (2ndly) it is impossible to obtain funds sufficient to cover the expense of mounting any but a small proportion of the specimens obtainable, in a form pleasing to the popular eye; (3rdly) many valuable specimens, especially birds and insects are much more safely stored in drawers, away from dust and light. Taking these facts into consideration, I now wish to arrange a typical collection of mounted specimens, say, for example, specimens of the various genera of birds occurring in the colony together with examples of any species which form any prominent feature, for general exhibition; and to form a second collection, again, we will say for example, of birds' skins of every species occurring, to be preserved in drawers and to be exhibited to all who may apply either to me, or to the clerk in charge of the Museum. I have, therefore, to ask your sanction also to this arrangement.

3rdly. I have to allude, though I do not yet feel in a position to offer any completely satisfactory suggestion, to the subject of *the difficulty of mounting specimens in the colony*. When I was in the colony before, having no assistant capable of mounting specimens, I had either to employ for that purpose from time to time the very inefficient bird stuffers etc., here, or to send all specimens home. Even at that time this arrangement was both inefficient and expensive; and now that H. Pauli, the best of the indifferent colonial bird stuffers, is dead, I cannot see how the arrangement is to work at all. Though, as I have said, I am not in a position to offer any solution to this difficulty, I may state that, having made enquiry from the Secretary of the Zoological Society at home as to the possibility of obtaining a bird skinner and collector at small cost, I found that one might be had, from the Berlin Museum, for £50 *per annum*, his passage money by Direct Steamer, and board and lodging while out here. If the Society should see its way in meeting me half way, if for instance the Committee of Correspondence would undertake to pay the passage money and to provide the salary of £50 per annum, I think I should be willing, in con-consideration of the relief which the services of such a man would afford me, to supply board and lodging to the collector. I may point out that according to this arrangement the whole expense to the Society would certainly not be more than the sum which used to be paid, and

is, I presume still paid, for the mounting of specimens here and at home, while the work would be much more satisfactorily done. I trust that this subject will be taken into consideration.

4thly. I wish to put on record that I shall consider it part of my duty to present to the Committee of Correspondence an *Annual Report of the work done in the Museum.*—I have the honour Sir, to be, your obedient servant,
EVERARD F. IM THURN,
Curator of the British Guiana Museum.
Georgetown, 9th January, 1882.

This letter having been referred by the Directors to Messrs. Hawtayne and Kirke for report, the following letter was received from those gentlemen :—

W. H. CAMPBELL ESQ., L.L.D. Chairman of the Committee of Correspondence.

SIR,—We have the honour to report on the letter addressed to you by the Curator of the Museum, dated 2nd instant and referred to us, as follows.

1. We think it undesirable to incur expense in printing a provisional catalogue which may prove to be incorrect or incomplete, owing to recent changes in the contents of the Museum or their arrangement but suggest that a rough printed copy of the MS. catalogue should be obtained for use as a hand-list in preparing a complete one.

2. However proper it may be in some instances to keep colonial and extra colonial collections separate, yet where a visitor or student desires to compare ethnological specimens found in British Guiana with those from other places, it would be of advantage to have the collections of these in close proximity. To have for instance, the few Guianese stone implements which are in the Museum placed at one end of it, and the European and other specimens at the other is not convenient, nor does it show as vividly as should be done the similarity of design in different parts of the world. Of course, these remarks do not apply to Natural History specimens, of which it would be improper to mix up in one case, or series of cases, specimens without reference to the habitat of each.

3. We recommend the adoption of Mr. im Thurn's suggestions as to keeping one typical collection for public view and a more complete and systematic one for the use of students and others. Books illustrative of the different specimens might be placed in the Museum for reference.

Some of the specimens now in the Museum should, we think, be replaced byothers more perfect or in better condition.

4. There being no local mounter of specimens we consider it would be of great benefit to secure the services of a skilled taxidermist as suggested; the salary we consider would be well spent.

Care of course would be taken to insure a supply of subjects, so that the person engaged would not be idle; and we suggest that by the sale or exchange of surplus specimens, additions might be made to the Museum from other and distant sources readily and economically.

It may also be pointed out that if the person employed to mount specimens had skill in making plaster casts and colouring them, a collection might be made of facsimiles of the fishes of British Guiana, which would not only be an attractive and ornamental addition to the Museum, but, being capable of multiplication, would be available for exchange with European and other collections for objects of interest.

We would also recommend in the interest of our creole population, most of whom are unacquainted with the process of manufacture of many of the articles in constant use by them, that it would be instructive to procure for our Museum exhibits illustrating some of these manufactures, for instance, those of calico or paper. A case containing materials shewing the different stages through which the cotton fibre passes before it becomes cloth, or which mark the conversion of rag or wood into pulp and thence into the varied forms in which paper is known to us, would be most interesting; and even if accompanied by such pictures of the machinery employed as it be thought necessary to show, such a collection need not cost much. One other object we would suggest as most worthy of the attention of the Curator: and that is the collection of drawings and plans of the few ancient buildings and monuments which still exist in the colony. We may refer to the fort at Kykoveral and the church and fort at Fort Island, the shell mounds at Warramuri &c., as some of the interesting subjects which will occur to members of the Society.

Old letters, records, and documents which, being preserved, may prevent the history of the earlier settlers being a "lost tradition," may be well sought for and acquired by the Society. It seems a reproach to the educated inhabitants of this and other colonies that so much that is valuable and interesting in relation to their predecessors' habits and customs has been allowed to perish from neglect. There doubtless may be

in the old documents formerly kept in the dome of the Public Buildings records and papers valueless as official documents, but most valuable as relics of a bye gone society. It would be only the duty of the members of our institution, as we venture to submit, were steps taken to acquire and preserve these. The arms used by the earlier settlers of various nations, such as guns, swords, pikes, and also old medals and coins, seals, stamps, autographs, specimens of the china and glassware, the household implements in use in bye gone years, would all most fitly find a place in our collection, and we venture to ask that the assistance, not only of our curator, but of the members of the Society and the general public be invited to this end.

In conclusion we are sure that the annual report which the curator undertakes to furnish will be most useful and interesting.

We have the honour to be,
Sir,
Your obedient servants,

HENRY KIRKE,
GEORGE H. HAWTAYNE.

The Vice-President said that these papers contained a vast amount of matter which the meeting was not in a position to go into that day. He proposed that they should be printed for general information, so that they might be discussed at the next meeting.

This proposition, having been seconded by the Hon. A. C. McCalman, was carried.

The following proposal to publish a Journal in connection with the Society was then read and discussed.

Georgetown, 3rd January, 1882.

To W. H. CAMPBELL, Esq.,
Hon. Secretary of the Royal Agricultural and Commercial Society of British Guiana.

Sir,—It has been suggested that the proceedings of the Society should be systematically published, in order that all valuable information accumulated by the Society should in future, as has not been the case in the past, be made available for reference and use. I wish to

recommend that the suggested publication should take the form of a half-yearly volume which should include :

1st. A brief account of the proceedings at the monthly meetings of the Society, together with such papers as may be read at these meetings; these papers being published either in full or in abstract, according to the circumstances of each.

2nd. Such other papers on the agricultural, scientific, geographical and literary aspects of the colony as may from time to time be obtainable. Of course, under the head of scientific matter would be published lists, as they can be compiled, of the animal and vegetable products of Guiana.

3rd. Short occasional notes on subjects similar to those mentioned in the last paragraph, wherever the available matter is not sufficient to warrant more extended notice.

4th A combined meteorological and agricultural record of each half-year, which might be obtained, with the assistance of planters and of the police-force, by establishing stations at certain points throughout the inhabited parts of the colony from which periodical reports on the rainfall, the readings of the thermometer and barometer, if possible the sunshine, and also the state of the crops, should be forwarded to the Agricultural Society as a common centre.

In further illustration of this suggestion I may briefly mention the available matter for the first half-yearly report.

The part might open with a succinct account of the proceedings at the monthly meetings in the present half-year and of the papers read at these meetings. Then might follow an abstract of the papers which have been read during the past year, these not having been already published in permanent form. These papers are, I believe, too numerous to be now published except in abstract; but with care such an abstract might be made to include all valuable matter. This might be followed, if the Colonial Government will consent, by a report on india-rubber trees of this colony which Mr. Jenman has already lodged with the Government Secretary. A paper on a colonial ethnological subject is available to be placed next; and this, in turn might be followed by a paper, the materials for which have been put into my hands, on a journey made last year in the vicinity of Roraima by an orchid collector. And lastly, as regards papers, I am in a position to add a carefully compiled list of the known literature of

Guiana from its discovery to the present time. Then would follow the occasional notes; and last of all would come the meteorological and agricultural record, though this latter would, I fear, be imperfect for the first half year.

I need hardly say that it would be both my duty and my pleasure to undertake the editing of the proposed journal; I trust however, that, at any rate as regards agricultural subjects, planters of experience would lend their assistance by reading proofs. As regards all the papers, I should suggest that the author of each paper should be requested to read the proof of the said paper before it is finally struck off for publication. With this exception, by which it is provided that the author has thus the means of preventing any statement of which he disapproves from being printed in his paper, it would be necessary that due discretion as to literary and other points should be left to the editor.

One other point connected with the proposed Journal seems to require notice; and that is the question of cost. I am not now in a position to give even the roughest estimate of the cost of the undertaking; but should it be desired, I should be happy to prepare such an estimate. I may just suggest that the cost of publishing the journal ought to be covered, at least in great measure, by a regular and fixed subscription from those gentlemen in the colony to whom such a journal ought to be of interest, and to whom the parts would be sent as they appear. I may also add that I know that such a journal, if it can be kept up to the standard at which it is proposed to aim, would meet with a certain number of subscribers at home. That this latter suggestion may be fulfilled, it is of the highest importance that the first number, which will necessarily be regarded as a sample of those to follow, should be first rate of its kind. But should the cost of publication not be covered by the subscription,—it is of course very likely that at the outset it may not be so covered,—the extra cost might be met either by the society; or perhaps the Government of the colony might even be induced to contribute. Possibly also it might be considered desirable to cover part of the expense of publication by admitting advertisements, concerning agricultural and similar matters.

Finally after much consideration, I am so convinced that this suggestion points to a most important means of developing the usefulness of this Society, that I should suggest that it should be undertaken, if

only for a year and as an experiment.—I am, Sir, your obedient servant,

EVERARD F. IM THURN,
Secretary to the Committee of Correspondence.

Mr. im Thurn stated that having, since the above letter was written, made a rough estimate of the cost of the undertaking now under discussion, he found that the cost to the Society would probably be but small.

The Vice President said he always considered that the publication of the proceedings was one of the first essentials, and that a great deal of the good of the Society was lost by the fact that there were no records of what had taken place in the past. He would recommend the publication of the Journal advised by the curator, and would propose that the experiment be made for one year, and that Mr. im Thurn should receive instruction to prepare the necessary papers.

Mr. Acting Justice Kirke said he had great pleasure in seconding the proposition of the Vice President. He thought that the journal would be of the greatest use and value, and he had not the slightest doubt that many gentlemen connected with the Society would contribute valuable papers towards the journal. He thought that the matter should be tried as an experiment.

Hon. A. C. McCalman thought that as the expense was small, the experiment should be made. He also thought that a record of the Society would be of advantage both to the growing generation and to people absent from the colony who took lively interest in the affairs of the colony. He was sure that the very moderate estimate of the cost would be readily met by the members of the Society, and he had very much pleasure in giving his

support to such a measure.

The Secretary said he was sure if Mr. im Thurn opened a subscription list it would be filled faster than he estimated.

The motion was carried.

Treasurer's Account.—The Treasurer handed in his account showing a balance in hand of $2,090 89 in favour of the Society on the 31st of December last, and Messrs. Sherlock and Glennie were appointed to audit the accounts.

The following donations to the Society were announced and thanks ordered to be given to the donors :—

A Binocular Microscope with a very complete set of apparatus, by Mr. Alexander Reid, late Manager of the Colonial Bank.

The third (and final) Report by H. Marshall Ward on the Coffee-leaf Disease in Ceylon, by His Excellency W. A. G. Young, Lieutenant Governor.

Three framed prints, by Mr. A. A. Ferreira.

The meeting then terminated.

Meeting held 9th February.—The Honble. Thomas Mulligan, President in the chair.

There were 14 members present.

Elections—*Members:* J. D. Hillis, M.D., John Turner.
Associates: J. B. Moore, George C. Collins, and L. D. Cleare.

The Treasurer's Account.—The Secretary said that the Treasurer's account had come up audited by Messrs. T. H. Glennie and W. H. Sherlock, who stated that they had examined it and found it to be correct.

The Lees Question.—The Secretary said that he had received from the Secretary of the Central Board of Health a letter written by Mr. A. R. Gilzean, manager of

Pln. Anna Regina, Essequibo, suggesting that the Society should call for papers on the subject of getting rid of the nuisance created by the lees on sugar estates.

The letter was as follows :—

"The proprietor of this estate has for some time been very anxious to adopt some arrangement for getting rid of the nuisance created by the lees and washing of buildings getting into the draining trenches of the estate. Mr. I. R. Tilley has favoured me with a tender for 3000 feet of 6 inch cast-iron piping, and a steam pumping engine to throw 200 gallons a minute, to send the lees and all the drainings of the buildings direct to sea. The pump he proposes would be of such a description as to withstand the corrosive action of the lees, and the pump and pipes would be occasionally washed out with pure water, which he believes would cause both to last for many years. Mr. Tilley's proposed arrangement would cost a large sum of money, but I would be inclined to advise the proprietor of *Anna Regina* to adopt it, if I were reasonably sure that it would answer the purpose desired. I have sufficient confidence in Mr. Tilley to believe that he would succeed in supplying a comparatively lasting apparatus, which would remove all the lees and drainage of the buildings direct to the sea without any getting into the drainage trenches. But on two subjects I am in doubt, and I would be very much obliged if the Central Board of Health could assist me with opinion or advice on these subjects:—Firstly, I do not know whether it would suffice to throw the lees &c., over the sea-dam and drop it at high water mark at neap tides. Secondly, I am in doubt whether the removal of all objectionable matter direct to the sea would effectually remove the nuisance, which it is proposed to pump over the sea-dam, at 100 roods from any drainage or other outlet. But it seems to me probable that an objectionable deposit would be left on the mud flat at low water, in which case the prevailing wind would tend to bring any unpleasant smell back to the Bush-lot village. I would be grateful if the Board would put me in the way of dealing with the lees nuisance at a moderate cost, if it does not approve of Mr. Tilley's scheme. Might I suggest that the Central Board of Health would be doing a favour to others who are in search of information as I am, by getting the Royal Agricultural and Commercial Society to call for papers on the subject of the best way of dealing with lees or other

objectionable matter from estate's buildings."

The President said he did not know whether any gentleman present had any suggestions to offer on the letter. It was certainly a very important matter, that of getting rid of lees. Some ten years ago there was a commission appointed by the Government on the matter, and they made some very valuable suggestions which were published at the time. He should suggest that a copy of that report be got from the Government Secretary's Office and be brought up at the next meeting. It was some time since he had read it, but some of the suggestions were very similar to the suggestions made to Mr. Gilzean by Mr. Tilley. There were, however, some other practical men who had given the question a great deal of thought, and it would be useful if the report was brought under notice again. It was written ten years ago, which almost represented a life-time in Demerara, and it had almost gone out of the recollection of most people. A full and complete inquiry into the matter took place at the time. The report was addressed to the Government.

In reply to the President,

Mr. Nicholson said he had seen lees carried long distances in earthenware pipes.

The suggestion of the President that a copy of the report should be obtained from the Government, was adopted.

Encouragement of Local Industry.—The Secretary said he had handed a letter from Mr. De Jonge to Mr. im Thurn, containing a suggestion about the prizes at the next exhibition.

Mr. im Thurn read the letter as follows:—

Demerara, 9th February, 1882.

W. H. Campbell, Esq.,

Hon. Sec. of the Royal Agricultural and Commercial Society.

Dear Sir,—As I shall not be able to attend the Society's meeting this afternoon, may I beg you to assist me in furthering the object I have in view, viz., to encourage different branches of local industry. I think it would be very advisable to offer prizes at the approaching exhibition for the best specimens of articles manufactured in the colony, say, by carpenters, coopers, engineers, masons &c., also by milliners, sempstresses &c., shoemakers, tailors &c. I know I am somewhat late in bringing the subject forward, but it is very important, and I trust the Committee of Correspondence will see their way to further such a good object. Of course, if anything is done, an early advertisement is necessary.

I have the honour to remain,

Yours truly,

I. H. DE JONGE.

The Secretary said that perhaps Mr. im Thurn would explain the position of the exhibition prize list. He believed it had been revised by the Court of Policy.

Mr. im Thurn said that the list of prizes had been revised several times, and had been passed through the press and revised by the Court of Policy. Under those circumstances he did not see how any other prizes could be inserted, but there was a provision in the rules that extra prizes might be awarded by the judges for *anything* that seemed to them to be deserving of a prize.

The Secretary was requested to communicate the circumstances to Mr. De Jonge.

Cane crushing.—The Secretary said that a communication had been received from Mr. Culverhouse giving a description of saw-rollers for reducing sugar cane to pulp. It had been sent to Mr. McCalman for his report and had not yet been returned.

The following donations to the Society were announced; and thanks ordered to be given to the donors :—

Annual Report of Board of Regents of the Smithsonian Institute, and reports of the Commissioner of Agriculture of Washington, 1865, 1867–68–71, by Colonel Figyelmesey.

The Circle of the Sciences, a Cyclopædia edited by James Wylde; and other books, by C. H. Massiah.

The meeting then terminated.

Meeting held 9th March.—His Honour Mr. Justice King in the Chair.

There were present 10 members.

Elections.—*Honorary Member*—Alexander Reid.
Ordinary Member—John McCarthy, Government Chemist, Trinidad.

A letter was read from the Government Secretary, enclosing the Report, which at the previous meeting the present had suggested should be obtained as bearing on the question of lees brought up at that meeting. The Report was dated 1869, and was by the Commission who had at that date made enquiry into the subject of lees.

A letter was read from the acting Government Secretary transmitting for the use of the Society, a copy of a work entitled, "Leprosy in British Guiana," by Dr. John D. Hillis, a medical officer in the colony.

The meeting then dispersed.

NOTE.—No meeting was held in April on account of certain repairs which necessitated the closing of the Rooms.

Meeting held 11th May—The Hon'ble Thomas Mulligan, President, in the chair.

There were present 13 members.

His Excellency Sir HENRY TURNER IRVING, K.C.M.G., was elected Vice-Patron of the Society.

The President, the Secretary, and the Treasurer were requested to wait on His Excellency, to request his acceptance of the office.

Elections—*Ordinary Members*—John Menzies, Maurice I. Coster, F. M. Hodgson, W. P. Thackwell.

Associate—L. H. Miller.

Mr. D. C. Cameron gave notice of the following motion to be proposed by him at the next meeting :—

"That the Society apply to the Governor and Court of Policy to place a certain amount of money, say $2,400, on the Estimates to be submitted to the forthcoming session of the Combined Court to be handed to this Society, for the purpose of offering premiums to peasant proprietors for the shipment of cocoa, coffee, rice, arrowroot, or other products of the colony, the marketable value of which shall not be under $240."

Treasurer's Account.—The Treasurer handed in his account, which showed that there was a credit balance in favour of the Society, of $3,665.

The Repairs of the Rooms—The President moved a vote of thanks to Mr. Conyers, for his services in superintending the erection of a new gallery in the Society's Rooms. The motion was seconded by Mr. W. H. Sherlock, and carried.

Contributions.—Mr. L. M. Hill presented the Society with 21 volumes of books.—The Government Secretary, at the direction of the Governor, forwarded a copy of the Census of British Guiana, 1881, and the Canadian

Patent Office Record, for February 1882.—Mr. im Thurn handed in copies of the meteorological papers published by the Government of the United States, presented by Mr. C. T. Hering, of Surinam, and also a copy of the *Barbados Agricultural Gazette and Planters' Journal*, presented by His Honour, Mr. Justice King.

The thanks of the Society were voted to the donors.

The Curator of the Museum.—The President said he had a proposition to make, which he felt sure would be received with pleasure and satisfaction. As they were about to lose the services of Mr. im Thurn, he proposed that the thanks of the Society be given to that gentleman for the valuable services he had rendered to the Society.

The motion was seconded by Mr. Glennie, who said that Mr. im Thurn had stated that although he would be giving up the appointment he held under the Society, yet he would still serve the Society as editor of the "Journal."

The motion was carried.

Mr. im Thurn returned thanks for the vote accorded to him, and expressed his hope that he might still prove of some use to the Society.

The meeting then terminated.

Meeting held 8th June.—The Hon. THOMAS MULLIGAN in the chair.

There were 14 members present.

Elections—*Ordinary Member:* Rev. Walter Heard.
Associates: Geo. L. Volkmar, W. H. Volkmar.

The President stated that the deputation appointed at

the last meeting of the Society to request His Excellency, Sir HENRY IRVING to become Vice-Patron had visited the Governor on the 12th of May, when his Excellency was pleased to accept the proposed office and to promise his best service to the Society.

The Secretary read a letter from the Government Secretary, dated on the 2nd instant, informing the Society of the International Exhibition of Colonial objects to be held at Amsterdam in 1883; a letter was also read from Mr. E. D'OLIVEYRA referring to the same subject. These communications having been carefully considered the Secretary was desired to inform the Government Secretary that the members present at this meeting were unanimously of opinion that, looking at the intimate relations which have so long subsisted between this colony and the Netherlands, it is desirable that the colony should take part in this Exhibition, and that the Society would be willing to undertake the collection and forwarding of exhibits, if supplied with adequate funds.

An extract was read from a letter by Mr. WILLIAM WALKER to the Secretary, dated 29th April, stating that the gift from the late Mr. JOSIAS BOOKER of £50 to be expended in the purchase of books for the Library, had, with Mr. BOOKER'S approval, been applied to the purchase of the new edition of the Encyclopædia Britannica now in course of publication, and of an oak case in which to keep the volumes, both of which were now in the Library.

On the motion of the President it was unanimously resolved that the thanks of the Society be given to Mr. BOOKER'S representatives for this very handsome gift.

Mr. WALKER in the same letter once more called attention to the question of Forest Conservancy in this colony, and expressed a hope that ere long it may meet with the attention its importance deserves, and quoted a parapraph from the *Times* newspaper of 18th April, stating that at the end of 8 or 10 years, the Pine Forests of Michigan, Wisconsin and Minnesota will have been so nearly exhausted that their produce will cease to be of any national importance, and that their destruction has been wanton, short-sighted and rapid.

A letter from Mr. ALEXANDER REID, dated 22nd April, was read, acknowledging the intimation of his election as an Honorary member of the Society, and stating that he will ever continue to feel a very warm interest in the prosperity of the Society.

A communication was received from Mr. JOHN GORDON, (formerly of plantation *Bel Air*), dated 15th May, calling attention to the advantages likely to be derived from Proctor & Company's Steam-digger, and forwarding a specification of the prices of the engine and digger combined, ranging from £470 to £600.—He said :

"I think such a machine would be of immense benefit to the planter. "The general obstacle to its working smoothly would be the banks and "ridges of the cane rows; but in preparing old cultivation for replan-"ting, it might, I think, be introduced with great gain. It has been "more than once proposed to plant canes on a level surface: and I do "not see why it should not be done, for I believe the principle advan-"tage of re-digging land is derived from getting the canes down into "soil from which the potash has not been removed by previous crops, "and it is now known that muriate of potash can be easily applied at "very small expense."

On the motion of Honourable WILLIAM RUSSELL, who remarked that it was pleasant to find an old colonist

remembering us and taking so much interest in the colony, it was unanimously resolved that the thanks of the Society be given to Mr. GORDON for his communication.

The following donations to the Library were presented :—

1. Histoire Naturelle, generale et particuliere—par M. de Buffon 17 vols. 4to., 1749-67—From Dr. Manget.

2. Barbados Agricultural Gazette, for May, with Meterological Tables—From His Honour Mr. Justice King.

3. History of the Jetties at the Mouth of the Mississippi River—By E. S. Corthell, C.E.—From Baron Siccama.

Ordered to be acknowledged with thanks.

Mr. RUSSELL pointed that it would be very desirable to make some arrangement whereby the services of Mr. FRANCIS, the Government Analytical Chemist, could be obtained by the Society, with a view to carrying out enquiries and experiments for agricultural purposes, either alone or in conjuntion with Mr. JENMAN, and intimated his intention to move in the matter at some future time.

The meeting then terminated.

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Notes on the Forests of British Guiana.

No. 1.—*By M. McTurk.*

THE necessity for the conservance of the forests, has long been apparent to many, not only those resident in the colony, but to casual visitors who have had the opportunity of seeing the reckless manner in which the forest is being denuded of its most valuable trees.

No restrictions as to size, time of cutting, or kind to be cut, are placed on the licensed wood-cutter by the Government, and as long as the wood-cutter has complied with the existing Crown Lands regulations and procured his licence, he has a perfectly legal right to cut and remove from his grant every growing plant of any size or kind. Again,—there are large tracts of land, on the Essequibo River particularly, over which persons exercise all the rights of ownership, basing their claims in most cases on titles supposed to have been granted them by the Government while the colony was in possession of the Dutch. These tracts of land are in some cases as large as the smaller counties of England, and in many cases their limits are undefined. A Commission was appointed in 1854 to inquire into the titles to these lands in Essequibo, and an extensive and interesting report was sent in to the Government. The suggestions of the Commissioners have never been acted upon, and for all the benefit that has accrued, the Commission might never have existed.

From these tracts of land, nine-tenths of the timber exported from the Essequibo is cut; and I mention this fact to show that, whatever regulations may be made for the conservancy of the forests,—until the titles and boundaries of these lands are defined, or the timber entirely cut off them, the conservancy will be long delayed, and in the mean time the alleged owners of these tracts will be enriched; for those persons who take out licences will have to conform to the regulations that may be enacted, while the others, by right of their alleged ownership, will be free from any restrictions.

Timber is, next to sugar, our principle article of export; and the cutting of timber legally or illegally is the principal occupation of those who reside above the sugar-estates, on our rivers. From below high water mark on the sea coast to the savannahs and mountains of the interior, a distance of from one to two hundred miles, the country, save where it has been cleared for the purpose of cultivation, is one unbroken belt of forest, containing a variety of woods both durable and ornamental, probably unsurpassed by any other country,—certainly not by any under British rule. At the great exhibition in London in 1851, this colony was awarded two prizes for the excellence of its woods. Most of these timber-trees are entirely unknown to science, and are known even to the woodcutters and a few other colonists, only by their—to them almost unpronounceable—Indian names, often ending in 'balli.'

GREENHEART *(Nectandra Rodiæi)* does not grow over extensive tracts of country as do wallaba *(Eperua*

falcata) and bullet-tree, but seems to grow only near the rivers and creeks, for about two or three miles inland from their banks, and is more and more scarce higher up the rivers' toward the savannahs. In the clumps of trees that grow on the savannahs, and in the forest for many miles from its borders, I have never seen greenheart growing. There is none growing on the Cuyuni River above the Payuco Falls, two and a half days' journey from its mouth. There are three varieties of greenheart, yellow, black, and mainop, all most serviceable and durable woods if cut when arrived at maturity. Greenheart is one of our tallest forest trees, and logs can be had from 18 to 24 inches square, and 70 feet long. Greenheart is one of the eight first-class woods at Lloyd's; and admirable kelsons, knee and other timbers, can be made of it. This wood is used generally throughout the colony in the construction of stellings, bridges, houses, boats, &c., and in England for shipbuilding, dock-gates, piling, &c. For all these purposes, when arrived at maturity, there can hardly be a better wood; but when young and sappy, it decays rapidly from the outside, and leaves a small core of durable wood, locally known as "tacouba," proportionate to the size of the original log. The bark and seeds of the greenheart are also exported, a medicine being made from them, called *bibirine*, somewhat similar in its effects to quinine.

The Indian name of the tree is in Arawack, *bibiroo*, in Accawoi, *rora-êk;* and in Carib and in the patois Dutch of the Essequibo, *sipiri*.

All the greenheart cut in the colony hitherto has been

from the forests below, or within a very short distance of the larger falls on the rivers, and owing to this limitation, combined with the manner of woodcutting operations and the cost of labour, this tract of country is now being cut over in some places for the third time, and such trees as previously escaped observation or were thought too small to be cut, being now carefully sought and cut down. The young saplings are cut to make rollers on which to haul the larger trees out to the river side, and the seeds are collected and shipped to make bibirine; thus it seems to me, we are striving in the most expeditious manner possible to get rid of all greenheart from below the falls.

The wood-cutters and those engaged in the timber trade are, I am aware, averse to any restrictions being put on them, though alive to the growing scarcity of the timber and its present inferior quality. "It will last our time," is their reply to any remarks on the subject.

When greenheart was first exported from this colony, one dollar per cubic foot was the usual price paid for the timber at the place of shipment,—28 cents is the price paid at present for the same wood, but of inferior quality, the inferiority being due to immaturity and consequent want of durability.

Of MORA, there are three varieties, *Red Mora* (*Mora excelsa*), *White Mora*, and *Mora-bucquia*. The red and white varieties are durable woods, especially such of the former as grows along the rivers and creeks up to the tidal limit. Red and white mora both grow in low situations, in swampy soil, and are often from 180 to 200 feet high, and may be squared to twenty-four inches

free from sap and holes. The largest mora trees grow on the Barima and Wai-ini Rivers, where they have not been cut or burnt down.

Mora-bucquia, which grows on high land, is inferior both in quality and size to the red and white varieties, and is never used by those acquainted with it except for inside work, where it will not be exposed to the weather. It is often sold to persons to whom it is unknown, as mora, and, when worked up, disappoints its purchaser and gives to all other kinds a general bad name. Mora-bucquia seeds are used by the Indians in making an infeiior kind of bread, only used in times of scarcity.

SOUARI *(Caryocar tomentosum, Dec.)* thrives best and seems to attain its largest size on the hills composed of a stiff yellowish clay, mixed with a gravelly kind of stone resembling oxide of iron. The trees are plentiful throughout the forest region, and seldom very far from a creek or the main river. Their average height is about 90 feet, and the timber can easily be squared to 24 inches; it is very tough and cross-grained. The trunks of the trees are seldom used, but the roots make excellent floors and futtocks for ship-building, and can be had sufficiently large to timber a vessel of large size. The souari-nut (butter-nut), well known both in and without the colony, is the fruit of this tree. The nuts, three or four in number, grow enclosed in a pulpy substance within a hard, round fruit.

DETERMA grows best in clay soil mixed with some gravel, and is probably more plentiful near Moraballi Creek, a tributary of the Essequibo River, than in any other part of the colony below the rapids. The average

height is about 100 feet, and it can be had to square up to 30 inches. This wood is of a colour resembling cedar, and is used for planking boats, in the construction of railway carriages, and for many other purposes where a light and strong wood is required. Determa is also used for the masts and spars of vessels; the largest spars procurable in the colony for these purposes are of this wood, from 70 to 90 feet long, and 14 inches in diameter at the smallest end. A log of this timber 42 inches square has been seen.

KABUKALLI is plentiful all over the colony, and thrives best in loose sandy soil. It is one of our tallest forest trees, and grows very straight; its average height is about 120 feet, and it can be had to square up to 30 inches free of sap. Kabukalli is used in boat building, and for timbers is little inferior to mora. This wood has a very unpleasant smell, and is disliked by worms. The Indians living in the wet savannahs, or where the rivers are unshaded by trees, prefer canoes made of this wood to any other, as it does not split when exposed to the sun. A gelatinous substance forms on the stump from which a kabukalli tree has been cut down; it has a disagreeable smell, and never hardens.

TATABOO grows in sandy soil, and is not a very common wood. The average height of these trees is about 80 feet. The wood is dark-coloured, heavy and hard, and well adapted for mill-bed timber; it is also used in boat-building, house framing, &c. Tataboo may be squared to 22 inches.

MAMOORI-BALLI is plentiful in Essequibo, and grows best in sandy soil. The average height is about 70

feet, and it can be had to square 16 inches. The wood is tough and hard, and is suitable for house-framing and other work where it will not be exposed to the weather.

PAKOORIE is plentiful on the Itooribisci Creek and generally throughout the county of Essequibo; it thrives best on low ground with sandy soil. The average height is about 80 feet, but the trunk is very large compared with its height; it can be squared to 36 inches free from sap. When mature this is a very durable wood, and is used for house-framing and many other purposes. The tree produces an edible fruit of the size and colour of a large orange, and a yellow sappy gum for which no use is known.

WAIBAIMA is probably a species of *Nectandra* or *Oreodaphne.* The wood has a strong aromatic scent and bitter taste, and is about the best wood in the colony for planking vessels. The trees are numerous on the Essequibo and Demerara Rivers. Their average height is about 90 feet, and as there is little or no sap, the timber can be squared to a large size, 20 to 28 inches. For planking and all other ship-building purposes for which greenheart is used, this wood is probably superior, and deserves to be placed among the first class woods at Lloyd's for ship-building.

KOOROO-BALLI or TRYSIL is plentiful. The average height of the trees in the forest on the upper parts of the river is about 60 feet; on the coast lands and in the swamps aback of the estates, where large quantities of it are cut for firewood, it does not grow so high; it can be squared 10 inches free of sap, and is a dark

close-grained wood suitable for making furniture. The bark is used by the Indians in cases of dysentery.

ITIKIBOURA-BALLI (*Machearium* ?) grows in clay soil and on the islands in the rapids of the Essequibo. It is comparatively a rare tree below the rapids, and does not attain an average height of more than 70 feet. The sap-wood is white; and its line of contact with the heart-wood, which is of a deep brown, almost black colour, is sharply defined. It can be squared to 15 inches free of sap, and is used for making articles of furniture and walking-sticks. It is one of the heaviest and closest grained woods in the colony.

SEEBADANI grows in clay and sandy soil, and has an average height of 90 feet. The wood is used for framing purposes, and can be had in large quantities; it will square up to 20 inches and has very little sap.

WALLABA (*Eperua falcata, Aubl.*) grows in loose sandy soil over extensive tracts of country, and is a wood known to every one in the colony. There are four varieties of this tree, locally known as *bimiti-wallaba*, *itoori-wallaba*, *karabimiti-wallaba*, and *sare-bebe*, meaning Humming-bird, Baboon, Red Humming-bird, and Water wallaba. The two first grow on loose sandy soil, and the karabimiti-wallaba on clay near the river's banks. Sare-bebe grows in the water at the edge of the river. The two last are never used; from the bimiti and itoori-wallaba, frames for houses are made, vat staves, paling staves, and shingles, both for colonial use and for export to the neighbouring colonies. These trees are all plentiful, and have an average height of 80 feet, and can be had to square 20 inches free of sap. The scraped

root of the itoori-wallaba is used by the Indians as a cure for toothache.

BARTABALLI (*Achras mammosa, Bonpl., Lucuma Bonplandii H.B.K.,*) grows on clay and sandy soils, and is found plentifully up the Essequibo and Demerara Rivers. The average height of this tree is about 90 feet, and it can be had to square to 20 inches free of sap. The wood is close-grained, light and of a pale brown colour, and is useful for making tables and other articles of furniture, and for partition boards, doors, &c., for houses. This tree produces a milky juice somewhat similar to that of the bullet-tree, but of a sticky nature; its fruit is one of the best produced by any of our forest-trees, and is eagerly sought for by the Indians during its season, (about the month of April) when, with characteristic recklessness, the trees are cut down in large numbers for their fruit.

TAUARONERO or Bastard Bullet-tree, (*Humirium floribundum, Mart.*) is fairly plentiful throughout the colony, and grows on sandy soil near, but not in, swamps. The average height is about 90 feet, and it can be squared to 20 inches. The timber is useful for framing houses, wheel-spokes, and many other purposes, and where small sized timber is required is superior to greenheart. The tree produces an edible fruit about the size of a grape. At the expiration of a week or ten days after cutting away the bark from the stem of these trees, a black substance, probably a minute fungus, emitting an agreeable perfume, appears upon them; this is scraped off and used by the Indians for scenting their hair oil.

BULLET-TREE or Burueh, (*Mimusops balata*) grows

plentifully, especially in Berbice, where it may be found 5 ft. in diameter; its average height is about 100 ft. and it can be squared to 42 inches. When windmills were used in the colony, bullet-tree was considered to be the best wood for the arms of a windmill. The gum known as balata is produced by this tree. The wood is dark red, closed grained and solid, and, when free of sap, most durable. During the time that the fruit is ripe many of the trees are cut down. The fruit resembles the well-known sapodilla in taste, and is about the size of a large English cherry; from the seeds, oil can be extracted. The bark of the bullet-tree is used medicinally by the Indians in the form of a clyster for a disease called kaina-kuhu, or 'buck-sickness', and occasionally as an emetic.

FUKADIE grows on sandy soil. Its average height is about 80 feet, and it can be squared to 16 inches. It is used for house-framing, and it is a durable wood for indoor work. This tree is very plentiful.

KARAHURA grows generally throughout the colony in dry places. It is one of the lightest of colonial woods, and is only fit for partition boards and other indoor work of a similar nature. It is used by the Indians for making canoes: its average height is 80 feet, and it can be squared to 30 inches.

HOOBOODIE or Wild Cashew, *(Anarcardium rhinocarpus)* grows in low situations near water, and averages about 80 feet in height; the wood is light and not very durable, and is only used for boards. The fruit is similar in shape to that of the ordinary cashew, (*Anacardium occidentale, Lin.)* and as well as the bark is of an

astringent nature, and is used medicinally in cases of diarrhœa.

LALLIFER is probably a species of *Nectandra* or *Oreodaphne*, and is comparatively abundant on the Essequibo but, like all the genus, is difficult to procure of large size free of holes; the wood has a strong aromatic scent, and is used in boat-building. Its average height is about 70 feet, and it can be squared to 16 inches.

MANIBALLI *(Siphonia bacculifera)* grows in dry situations and is a most durable wood when free from sap; it is superior to greenheart where small sized timber is required. It grows tall and straight, is close-grained and of a brownish-yellow colour. Its average height is about 100 feet, with a very small top. It can be squared to 20 inches. Manniballi produces a sticky yellow gum, which is not used for any purpose as far as I am aware.

There are two or three varieties of KAUTA-BALLI, *(Moræa* or *Artocarpus ?)* distinguishable by the size of their leaves. It grows largest on clay soil mixed with gravelly ironstone. It is plentiful on hilly land, attains an average hight of 80 feet, and can be squared to 14 inches. The wood is useful for house-framing, is hard and has a close straight grain. The fruit of the kauta-balli is not edible; its bark, made into charcoal and ground to powder, is used by the Indian women to mix with the clay of their pots, goglets, and other earthenware vessels.

WADADURI or Monkey-Pot, (*Lecythis grandiflora, Aubl.*) is plentiful throughout the colony; it grows to a

large size on sand and clayey soil, and attains an average height of about 100 feet. It can be squared to 28 inches. It is used for furniture, house-building, &c., and formerly for hogshead staves. The tree bears a nut which is sometimes eaten; and a fine oil can be extracted from the kernels.

WAMARA is plentiful above, but not below the rapids. It grows on sandy soil and does not average more than about 60 feet in height, and can be squared to 12 inches free of sap. The heart is exceedingly hard, heavy, and very close-grained, resembling ebony. The sap wood, of which there is very little, is of a yellowish white colour; on exposure to the weather it rots away from the heart rapidly. The Indians make their clubs from this wood: it is little used owing to its extreme hardness, but it is a fine wood for inlaying and other cabinet work.

IRRIARIADAN (*Cassia* sp.) is to be found on the Moraballi Creek, where it grows plentifully on high sandy soil. It is a fine wood of a dark brown colour, and suitable for partition boards, staves, and many other purposes. The average height is about 80 feet, and it can be squared to 10 inches free of sap.

DUKURIA is plentiful throughout the colony, growing in dry soils; it is used for house-framing and many other purposes, and is a very serviceable wood. Its average height is about 90 feet, and it will square 16 inches.

DAKAMA-BALLI grows plentifully near the water; its average height is about 80 feet, and it will square 20 inches. The wood is little used. From the seeds of the dakama-balli a starch is extracted which is considered

very efficacious in cases of dysentery or diarrhœa. The Indians when their cassava fails, use the starch mixed with decayed wood to make a kind of bread. The bark is useful for tanning.

ETA-BALLI is plentiful in low situations near the rivers and creeks. The wood is little used. The tree attains an average height of about 90 feet, and will square 18 inches free from sap.

WILD GUAVA grows best in rocky soil. There are four varieties of this tree. The bark is a powerful astringent, and contains tannin. These trees are not plentiful, and the wood is little known or used, but where a light, tough and close-grained wood is desirable, it should answer admirably. Its average height is about 60 feet, and it will square 10 inches.

ARRISOUROO grows plentifully in low situations near the river. This wood is of a dark yellow colour, and has a very bitter taste; it lasts long exposed to the weather, and is not eaten by worms; for which reasons, it is well adapted for planking vessels and making estates' kokers. The average height is about 80 feet, and it will square 14 inches. A decoction of the bark is used for dressing ulcers, and the sap as a remedy for ring-worm.

KAMARAKARTA is a dark brown close-grained heavy wood, of a bitter taste. It is very lasting, and is used for boat-timbers, for which purpose it answers well. It grows in Mahaicony, and on the Essequibo in low places near the river (often over-hanging the water), and on the islands in, and above the rapids. Kamarakarta is comparatively a short tree, not averaging more than 50 feet in height, but has a large trunk. It can be squared to

22 inches, free from sap, of which there is very little.

DUKALA-BALLI is a rare tree, and grows in clay and sandy soil. The wood is of deep red colour, heavy and close-grained, and is used for making articles of furniture, bedstead-posts, &c. It takes a fine polish and is a durable wood. It grows to a large size; its average height is about 120 feet, and it will square 20 inches.

SURADANNI grows in low situations, and is plentiful. The wood is of a deep red colour, grows to a large size and is used for making canoes, planking boats and many other purposes.

Of CARABA OR CRABWOOD, (*Carapa Guianensis, Aubl.*) there are two kinds, white and red, both of which attain a large size and are very useful woods. From the trunks canoes are made; and sawn into boards it is used for making furniture, partitions, flooring &c. Masts and spars are sometimes made from crabwood. The seeds yield the well known 'crab-oil' and the bark is used for tanning. This is one of the few trees in the colony of which all the parts are useful. The average height of a full grown tree is about 120 feet, and it can be squared to 30 inches.

FOGLEKOP grows in sandy soil, and is a light-coloured closed-grained wood of little weight, which is plentiful on the Essequibo and Pomeroon Rivers; sawn into boards it is useful for indoor wood, partitions, doors, &c. Its average height is about 70 feet, and it will square 12 inches. It has a small eatable fruit, the seeds of which contain oil.

HOUBOO-BALLI grows plentifully on the Itooribisci Creek. The wood is of a light brown colour, variegated

with black and brown veins; it takes a fine polish and is useful for making articles of furniture, and cabinet work of any description. Under water it lasts a long time, and on the bottom of a punt or boat will outlast almost any other wood. The tree attains to an average height of about 100 feet, and will square 20 inches free from sap. The bark contains a sticky gum.

SIMIRI.—(*Hymenæa Courbaril, Lin.)* is abundant and grows best in white sandy soil. The wood is hard, heavy and close-grained, of a brown colour streaked with veins, and takes a fine polish. It is used for making furniture, mill-beds, and tree nails for planking ships. There are two varieties of this tree, *simiri* and *k'wanarri*. The pulp surrounding the pods of the beans is edible. The Indians make wood-skin canoes from the bark. The tree yields the gum-animi or "locust gum" of commerce. The gum is found in large quantities where a tree has rotted away, many barrels-ful being often taken from one spot; the gum forms in the inner part of a hollow tree, and it may also be procured in small quantities by tapping.

HIAWA-BALLI, *(Omphalobium Lamberti, Dec.)* is a rare tree and its wood is in great request for cabinet-work. It is easily worked and of great beauty. It grows in sandy, rocky soil, and often attains a large size. Its average height is about 90 feet, and it will square 12 inches. It has a sticky gum.

SIRIBIDANNI grows in loose sandy soil and is plentiful in some localities. It does not grow to a large size and the wood is very sappy. The heart is of a purple colour close-grained and hard, and is useful for inlaying and

making furniture. The sap of this wood decays rapidly on exposure to the weather. The average height is about 50 feet, and it will square from 4 to 6 inches.

SIMARUPA (*Simaruba officinalis, Dec.*) is plentiful throughout the colony, and grows to a large size on sandy soil and on islands in the river. The wood is of a light colour, light and close-grained, and is one of the most useful woods for partition, and other inside house wood. Wood-ants will not eat or injure it. The average height is about 90 feet, and it will square 24 inches. The bark of the root is used medicinally in cases of diarrhœa.

KURAHARA grows in sandy soil and on the edges of swamps. The wood is red, of the colour of cedar, and floats in water; it is used for making canoes, planking boats and spars. The average height is about 96 feet, and it will square 20 inches free from sap. It has a resinous gum not used for any purpose.

DUKA, of two or three kinds, grow on dry sandy soil. The wood is light, and sawn into boards is useful for indoor housework, tables, &c. Its average height is about 50 feet, and it will square 10 inches,

HACKIA (*Tecoma* sp?) grows plentifully in some localities on dry sandy soil, and during the time it is in flower, in the month of November, is one of the most beautiful of our forest trees. The wood is exceedingly hard, close-grained and heavy, and of a brown colour. It is valuable for making cogs and shafts, but is almost too hard for any other purpose. The average height is about 65 feet. It will square 12 or 14 inches.

KUMARA or Tonkin-bean, *(Dipterix odorata, Willd.)*

grows plentifully in some localities, especially above, and on the islands in, the rapids of the Essequibo River. Kumara is a closed-grained heavy brown-coloured wood, exceedingly tough and durable, and is useful for cogs, shafts, and any other purpose where a strong wood capable of resisting great pressure is desired. This tree yields the well known tonkin-beans; they are used by the Indians to perfume their hair-oil and when put among clothing are supposed to keep away moths and other insects. An oil can be extracted from beans. The average height of the tree is about 90 feet, and it will square to 22 inches.

KURAROO, or Bat-seed, is a tree common throughout the colony, and may be seen growing in Georgetown, where it is known as wild-olive. Its wood is hard but not very durable, and is little used; it takes a fine polish and would be useful for furniture. This tree does not grow very tall, but the diameter of the trunk is great in proportion to its height. Its average height is about 68 feet, and it can be squared to 39 to 48 inches in short lengths.

ARAMATA is comparatively a common tree throughout the colony, and grows on sandy soil. It is a dark-coloured hard wood, and is used in boat-building, house-framing, and sometimes for cabinet work. Its average height is about 80 feet, and it can be had to square 12 inches free of sap. A decoction of the bark is used by the Indians to wash their dogs, and sometimes their own heads, to destroy vermin.

WARIKURI or WHITE CEDAR grows plentifully in swampy places. When mature it is a dark brown, hard,

heavy, and close-grained wood with a white sap, very durable, especially under ground, but splits if exposed to the sun. It is probably the best wood procurable in the colony for foundations. Its average height is about 60 feet, and it will square 10 inches.

BROWN SIRUABALLI grows to a large size, and is used, like other siruaballis, for boat-building, for which purpose they seem specially adapted. It attains an average height of 90 feet, and can often be squared to 36 inches.

OOLOO grows plentifully in loose sandy soil. The wood has a strong aromatic scent, is of the colour of pale cedar, and should be useful for drawers and shelves of wardrobes. Its average height is about 90 feet, and it can be squared to from 16 to 18 inches.

HIAWA (*Icica heptaphylla, Aubl.*) grows plentifully in Essequibo in loose sandy soil; its wood is little used, as it decays rapidly on exposure to the weather. Like ooloo, it has a strong aromatic scent, is light, and should be useful for drawers and wardrobe shelves. This tree produces the gum known as hiawa, or resin of conima, which is burnt as incense. The average height is about 50 feet, and it will square 10 inches.

KURANA or RED CEDAR (*Icica altissima, Aubl.*) grows to a large size and is plentiful in some localities, especially on the Waini River; it is also found on the Cuyuni and Corentyn, and on the upper part of the Pomeroon; it grows generally in low situations in clay soil. Red cedar is a most serviceable and valuable wood, and its uses are too well known to require description. The tree averages 100 feet in height, and is sometimes 38 or 40 inches in diameter.

WASHIBA OR BOW-WOOD grows to a large size, but it is a rare tree and little known. Its wood, of an olive colour, is exceedingly tough, hard and close-grained, and is the best known wood for bows. Its average height is about 120 feet, and it can be had to square 30 inches, free of sap.

TIBICUSI or BASTARD LETTER WOOD is a rare wood, and only used for bows, walking sticks and inlaying cabinet work. The heart is beautifully marked, hard, heavy, and close-grained. The sap decays rapidly if exposed to the weather. The average height is about 60 feet, and it will square 5 inches.

BURO-KORO, PAIRA or LETTER-WOOD, (*Brosimum Aubletii, Piratinera Guianensis Aubl.*) is a rare tree near the coast, but plentiful in the interior. Its wood is used for the same purposes as tibicusi. It is beautifully marked, close-grained, takes a high degree of polish, and is very heavy. Letter-wood trees are sometimes of great size, but the heart, which is the only useful part, is very small,—a tree of 29 inches in diameter having only 7 inches of heart; the average height is about 60 feet.

KERITEE is a species of siruaballi, and is plentiful in some localities. The wood has a strong aromatic scent, is light, and in colour and appearance, resembles satin-wood; it is useful for partitions and the upper planking of boats. Its average height is about 80 feet, and it will square 20 inches.

KOOROOBOORELLI or PURPLE-HEART (*Copaifera ubiflora,* and *bracteata, Benth.*) is of two kinds, called *kooroobоorelli* and *marawinaroo.* The bark of the

marawinaroo, (which is not so durable and has a more sappy wood than kooroobooreIli) is used, as is also that of the simiri or locust, by the Indians for making canoes or "wood-skins." These are sometimes of large size, accommodating 15 or 16 persons. Purple-heart is one of the tallest of our forest trees, and its round top may be easily distinguished, rising above the surrounding forest on the hilly lands of the interior. The wood is of a purple colour, hard, closed-grained, durable and very tough. It is a fine wood for mill-beds, house-framing &c., and is capable of resisting great strain. Its average height is about 120 feet, and there are many trees nearly, if not quite, 200 feet high. It can be squared to 30 inches.

YELLOW SIRUABALLI has a light wood of bright yellow colour, with a strong aromatic scent; it is used principally for planking boats, and is most durable. Yellow siruaballi often grows to a very large size in loose sandy soil, but is difficult to procure over 12 inches square, free of sap. The average height is about 60 feet. The bark is useful for tanning.

AWATI is a light wood, of close grain, the colour of white-pine, and is useful for indoor work. This wood is little known and not much used. A decoction of the bark and seeds is used as a wash by the Indians in cases of small-pox, and is said to be very effective in healing the pustules. The average height is about 60 ft. and its diameter 16 inches.

KAKARALLI (*Lecythis ollaria, Lin.*) has a close-grained and tough wood, of a light brown colour; it is used for house-framing, building wharfs, &c. It is

said that barnacles will not eat or injure kakaralli. The trees grow tall and straight, but are too heavy to make spars. The inner bark of the white kakaralli is used by the Indians as a substitute for, and in preference to paper, for making their cigarettes, and is called "queeka." The average height of the tree is about 80 feet, and will square 16 inches free of sap.

BUHOORADA is a large tree, common throughout the colony; it has a large top with reddish-brown leaves. The wood is heavy and close-grained, but it is not well known and is little used. Its average height is ahout 75 feet, and it will square 20 inches free of sap.

As I have already stated, no restrictions as regards size, the time of cutting, or the kind of trees to be cut, are placed on the licenced wood-cutter; and the aboriginal Indians who are allowed to cut timber from any part of the unoccupied Crown Lands, are restricted only as far as regards size,—they are not allowed to cut timber over twelve inches square.

This latter restriction however is easily evaded, especially so, as there is virtually no one to see it enforced. *Indians*, as a rule, rarely cut timber over twelve inches square; for they are unable to haul such heavy wood out of the forest. The half-breeds and squatters on the Crown Lands are the persons who do this; and the shippers of the timber are the instigators of both,—supplying them with punts, chains and provisions while working, and on some occasions with gangs of men to haul out and transport to the place of shipment the timber they have cut. Timber under twelve inches square is called framing timber, and of twelve inches and over,

shipping timber; comparatively little of this latter size is used in the colony.

The first step, I think, to be taken in the way of forest conservancy in this colony, must be made by settling the rights of ownership to the land producing the timber, by deciding whether it belongs to the colony or to the persons who lay claim to it. These lands were originally granted to the ancestors of the present claimants, on certain conditions, and with the intention to promote colonisation by establishing cultivation. It was generally an express condition of the land-brief, that the land should be put into cultivation, and suitable buildings erected thereon. No very intricate enquiry is necessary to determine whether these conditions are being complied with. In no single instance was the land granted for the purpose of cutting timber only. The settling of this matter is, I think, of paramount importance owing to the size of the tracts of land claimed, and their undefined boundaries; this being settled, it becomes necessary to consider what restrictions should be placed on the wood-cutter with regard to the size of the different timber trees they are to cut, the gathering of seed and the time of cutting.

Greenheart, which is the only timber shipped from the colony in any quantity, and is the one that most needs conservation, ought not to be cut under twelve inches square, and Indians should not be allowed to cut this wood. The trade in greenheart should be limited to licensed wood-cutters, as some compensation for what, for a time, they will consider a grievance, —the imposition of any restrictions upon them. No

trees should be cut merely for the seed and bark, as has often been done with hollow trees, and seeds should not be gathered more than once in every two years, or kept in store on the wood-cutter's grant or premises after the end of the year of gathering.

The following table gives the sizes below which timber of various kinds should not be cut :—

All varieties of	Mora	should square not less than	12	in.	3.
Do.	Wallaba	do.	8	„	3.
Do.	Bullet-tree	do.	8	„	2.
Do.	Wadaduri [1]	do.	10	„	2.
Do.	Mani-balli [2]	do.	8	„	2.
Do.	Kooroo-borelli	do.	12	„	2.
Do.	Simiri [3]	do.	12	„	2.
Do.	Sirua-balli	do.	8	„	7.
Do.	Kakaralli	do.	8	„	2.
Do.	Houbooballi	do.	12	„	1.
Do.	Hiawa-balli	do.	9	„	2.
Do.	Dukalaballi	do.	10	„	1.
Do.	Kurahara	do.	10	„	1.
Do.	Koorookoi	do.	8	„	2.
Do.	Aramata	do.	9	„	1.
Do.	Kumara [4]	do.	12	„	1.
Do.	Hackia	do.	9	„	1.
Do.	Carapa [5]	do.	10	„	2.
Do.	Kabukalli	do.	10	„	1.
Do.	Kurana [6]	do.	12	„	1.
Do.	Warikuri [7]	do.	7	„	1.
Do.	Determa	do.	12	„	1.
Do.	Pakoorie	do.	10	„	1.
Do.	Suradanni	do.	10	„	1.

1. Also called Monkey Pot; 2. Purple Heart; 3. Locust; 4. Tonka Bean; 5. Crab-wood; 6. Red Cedar; 7. White Cedar.

The figures in the margin indicate the varieties of the same tree known to the writer.

There are many other woods known to the wood-cutter, durable in such places as such small wood is generally put, which, if a smaller size of timber is required, can be procured plentifully. The above list of woods could be amended from time to time, as experience would determine, by increasing or diminishing the sizes, or by adding to it the names of othei woods.

Regarding the cutting of timber by Indians, the privilege has been much abused ; there are comparatively few *Indians* that avail themselves of it, and these only at long intervals. Those who really benefit are the half-breeds and squatters, many of the former being in appearance so like an Indian, that in many cases, unless to those intimately acquainted with them, they pass for Indians; some of them too speak the Arawack language, and all the patois Dutch of the river they live on. Nearly all the timber supplied to the estates on the rivers and West Coast is cut by these people. There are persons on the rivers who keep small punts, known as ballahoos, almost solely for hire to these men to carry their timber to a market. This timber is sold on the estates, often for from 8 to 10 cents per cubic foot. As those who cut it are put to no expense beyond the punt hire, and time is of no account to them, whatever they may get for the timber, less punt hire, is clear profit.

Since 1873, when the offices of Revenue Officer and Assistant Revenue Officer were abolished, many persons who, previous to that time, took out licences to cut wood on the Crown Lands have ceased to do so, and find it more profitable to purchase their timber from the self-named Indians. To remedy this, I think that the "Regulations defining the privileges henceforth to be enjoyed by the Aboriginal Indians of this Colony in relation to the Crown Lands and Forests," made by the Governor under the provisions of Ordinance No. 12, of 1871, and published in the *Official Gazette* of 12 September, 1871, require revision.

The term "aboriginal Indian" requires definition, and should be stated to mean a person of pure Indian blood, one whose parents are both aborigines. Indians should not be allowed to cut greenheart at all. This would prevent the trade between so-called Indians and the wood-cutters which is prohibited by the 3rd section of the regulations; for greenheart is at present the only wood the wood-cutters purchase from them. In the same section, (section 3) for the words—"any one engaged in the business of woodcutting," I think the following should be substituted:—any one holding a woodcutter's licence or licence of occupancy, excepting, in the case of the person holding such licence, the wood shall be required for the erection of buildings to be used by him on his grant and not for removal.

When an Indian wishes to cut wood on any unoccupied Crown Lands, he should notify his intention to do so, *in person*, to the River Magistrate, the District Commissary or some other person who may be authorised to receive his notice, and should get permission to cut such timber, in writing. All timber purchased from Indians should be paid for in money and not in provisions, cloth, or liquor, as is usually done, (notwithstanding the prohibition); *and it should be enacted that no person can recover any cost of provision, cloth or liquor advanced or paid to an Indian on account of timber.*

Any Indian who may not comply with such regulations as may be enacted, should, for the first offence, pay the cost of the proceedings against him, and, for the

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second offence, should forfeit the privileges granted him by the regulations. Copies of the regulations should be sent to the Indian Missions and Police-stations on the rivers.

As only very small quantities of greenheart are to be had at present below the falls, and that of an inferior quality, if the timber trade is not to cease entirely owing to this tract of forest being exhausted, some other means must be devised to maintain the supply. This can only be done by getting the timber from above the falls.

On the Essequibo River, above the falls, there are many millions of cubic feet of the best timber growing very near the edge of the water. Its proximity to the water is a material circumstance, as every log has to be hauled to the river or creek by gangs of men. Cattle or mules in such localities suffer much from the attacks of bats, and must be fed on hay and oats, as no suitable fodder can be found in the forest in sufficient quantity to feed them; thus they are seldom if ever employed.

The land between the Essequibo and the Demerara Rivers is comparatively low, and some of the creeks from both rivers have their sources in the same savannahs; so that if the upper parts of the creek were cleared it would be possible in the wet season to go right across from river to river, by ascending one creek and descending another. All the large creeks on the respective rivers have their sources very near each other, and by connecting two of these creeks by means of a canal I think the desired end would be gained, supposing the positions of the creeks to be suitable. The creek on the Essequibo must enter that river above the series of falls

commencing at Coomacka-serima, and that on the Demerara below its falls.

The Wanari Creek on the Essequibo and the Balmatero Creek, a branch of the Coreta Creek, on the Demerara; the Paruacash on the Essequibo and the Quiniperoo Creek on the Demerara; the Grooa-caboora on the Essequibo and the Coreta Creek on the Demerara, would I think, be the most suitable. The pair last-named would be best of all; they are both large and deep creeks, and their heads are within half a mile of each other, separated by a patch of sandy soil principally covered with wallaba. By connecting these creeks, the Essequibo and its tributary creeks would be opened to the wood-cutter, free of falls, as far as the cataracts at Warapoota, above the mouth of the Potaro river, and up that river as far as Toomatoomari Falls. It would be necessary to put one or more locks between these creeks, in order to regulate the flow of water from the Essequibo, it being the larger river and flowing from a higher country than the Demerara.

The expense of making this connection between the two rivers and putting in the locks, might be paid off in time by a toll levied on all craft passing through it.

The old system of Revenue Officers and Assistant Revenue Officers (abolished in 1873) was, I think, good as regards the forests, and, with some modifications, should be restored. The persons to fill these situations should be chosen with care,—the Revenue Officers with regard to their knowledge of the forest and the manner of conducting wood-cutting operations, and the assistants, with due regard to their honesty. The Re-

venue Officers should also reside within those parts of their districts where wood-cutting is practised, and not, as did the Revenue Officers of Demerara and Berbice, in Georgetown and New Amsterdam. The surveying which the Revenue Officers did (they were also Assistant Crown Surveyors) should be done by officers from the present Crown Lands Department. There should be an officer to supervise the Revenue Officers and their assistants, and to see that their duties were efficiently performed and without partiality. The Assistant Revenue Officers, in addition to their share of fines and seizures (which was all the remuneration they got), should be paid a small monthly salary.

No doubt many and better suggestions might be made by persons of more experience in the conservation of the forests, but, in all first attempts of whatever nature, many things that after-experience proves necessary must be inadvertently omitted; the knowledge of these omissions can, however, only be gained by time and the adoption of some regular system. At the same time I do not think for the present any very elaborate system is necessary. What is most wanted is a beginning.

Although aware of the fact, I have made no remark on the change of climate that ensues when a country is cleared of its trees, as from the rapid growth of vegetation and the vast extent of forest-covered land here, there seems no probability of our being so affected, and such an event will be for the consideration of future generations.

No. 2—By the Hon. William Russell.

In making any remarks on the conservation of the forests of Guiana it is as well to examine into the present laws which affect the operations of the wood-cutters. By Ordinance 9 of 1873, the last enacted on the subject, which chiefly repeats those that have gone before, the only restrictions enjoined after compliance with the necessary formula for obtaining a license, are contained in the 16th section, which enacts as follows:

1. That the holder shall not sub-divide or sublet his interest in any such licence except with the special permission of the Governor.
2. That in the event of the holder employing Indians he shall keep a book to be open at all times to the inspection of the Stipendiary, or Special Magistrate of the district, of the Crown Surveyor and Assistant Crown Surveyor, and of the Commissaries of Taxation, in which must be regularly entered the name and tribe of every such Indian, the rate of wages allowed him and the amount paid; and all such wages must be paid in money.
3. That the holder shall not give or deliver to any Indian any spirituous liquor as an equivalent for, or in part payment of wages, or for any work or labour done or performed, or to be done or performed for him by such Indian.
4. That the holder shall place and keep on the façade of his land on or near to each branded paal, a board or tablet on which shall be painted in plain legible letters and figures the name of such holder, the length and depth of the façade, the compass-bearing of the side lines of the lands, and the date of the instrument under which he holds; and the holder shall keep such board or tablet with such inscription in good order and repair during the whole of his tenancy.

These being the conditions, only after the second conviction for non-observance of which he can incur for-

feiture, there is nothing to which he cannot easily attend, or to a great extent transgress, nor much that can cause him apprehension. Mr. McTurk has well stated that no restrictions are placed on the wood-cutter as to size of timber or time of cutting; and the opportunity now arising from the present ventilation of the subject should not be allowed to pass without some good work being done in moving the Government to have well-considered measures of restriction added to the existing regulations on the subject.

The wood-cutter, with the aid of Indians or boviandders searches the forests, and on finding a suitable location, with the particular timber growing thereon for which there is a demand, makes a cast to find out the nearest creek, as the means of enabling him to convey his timber to the main river; and it is from such creek or river that the façade is measured off by the land-surveyor, as the boundary of the grant. From paals there planted, it is compulsory to cut lines right round the boundaries of the grant; and the land-surveyor plants his paals at each corner. Any timber cut beyond these paals belongs to the Crown and is subject to seizure by the Commissary.

The wood-cutter, now supposed to be in lawful possession of his grant, prospects for the best paths to haul the timber to the creek. Having decided upon these, he sets his workmen to fell all the trees that may be in the way, and without reservation cuts down in any direction young trees of 5 or 6 inches diameter, as rollers to facilitate the hauling of the timber, and to make the path, ravines having often to be bridged with timber felled without reference to kind or age.

The grant being ready for the fellers and squarers, the giants of the forest soon begin to fall, crushing all smaller trees that may be in their way. This alone causes considerable destruction to the saplings and half-grown trees.

In addition to mora, greenheart, and wallaba, the three woods most sought after, the forests are one maze of the various woods native to Guiana, and the seeds, being sown by nature, are found in all stages of growth, from the simplest sapling to the giant. When left entirely to nature the young trees have no chance of growing, as they are overshadowed by those older; but when by storm or decay a giant has fallen, room is given for the strongest of the survivors, and in a few years the blank made by the ripe or fallen tree is well supplied by those which had before been struggling for bare existence. Let us see in what respect the wood-cutter departs from nature in his operations.

Reference has already been made to path-making and the indiscriminate destruction of young trees for that purpose. Some restriction should be made in this respect, because the grant-holder has no interest in the future; all he wants is the greatest quantity of merchantable timber that he can get out in a given time.

Little can be urged against the present mode of felling and squaring timber; but one feels sorry on walking over the ground to see so many fine young trees sacrificed to the fall of the ripe trees. In the thick forests of the tropics, however, it is impossible so to fell one tree as to avoid the destruction of others. After all, this destruction may be looked upon as thinning out;

and when the visitor returns after a few years absence he is astonished to find how little sign is left of the woodman's work. Young and healthy trees have taken the place of those cut down, and in course of time the wood-cutter of the future will again be in a position to thin out the ripe wood.

Those who have seen the woodman at work in the old country, with his waggon and team of horses carting away the felled timber, would be rather astonished to see the Demerara wood-cutter carrying on his operations. As already indicated, the trees are felled by the same men who do the squaring. The North American axe being used for felling, the tree is then cut to such a length as will give a well proportioned log—50 to 60 feet being quite a common length. With the felling axe a series of notches is made on the upper surface of the log, which is then canted on its side; and the broad axe is brought into play. This is a tool, about 15 inches broad in the face, with the edge champered on one side, with which the squarer, with great dexterity, slashes off the divisions between the notches, leaving a surface nearly as smooth as if planed. The next side is notched in a similar manner, and a line is struck, guided by which the workman turns out one of those wonderfully squared logs which are brought to market.

The haulers now come in, often a hundred stalwart men, some armed with hand-spikes, with which to guide the log, while others attach to the log a chain, to which again is fastened a long rope having short pieces of wood*

* These sticks are called *grail-sticks*; what is the etymology of this word?—ED.

tied on at about equal distances, by means of which the men yoke themselves in couples. A lad, with a saucepan filled with tallow, leads the way, and with his hands rubs a small quantity of grease on the side of the timber. Then, singing a chorus, the men stretch to the work with a will and make the huge log spin like a plaything along the timber path until it thunders down to the bank of the creek. The balahoo—or punt—men here lay hold of it, and taking advantage of the water in the creek, the ballahoo is canted, and the timber made fast. Then with a lever the balahoo is canted to the opposite side; and the second log is made fast. The lever being now withdrawn, the load is equally divided. Balahoo and load are now poled down to the timber-landing, where ships from Europe take in the load. This is a brief outline of how the legitimate wood-cutter manages his business.

There are, however, others whose operations are of a different kind. Of these may be mentioned first the bovianders, who cut and square timber for local use, felling young wood squaring as low as six inches. They also cut beams and spars down to 3 inches in diameter. Tacouba posts are also manufactured by them *from young wood,* by simply chipping the bark and a little of the sap wood to make it appear the true article or tacouba, which is really the heart of the tree. A tree 12 to 14 inches in diameter will only afford a tacouba 6 to 7 inches; men of this class are the great destroyers of the forests. The Indians, too, have permission to cut such timber on Crown Lands as does not square above 12 inches; thus the law would seem to provide for these primitive sons of the soil to be as destructive as bovianders or small wood-cutters.

Then there are the charcoal-burners, before whose axes every hard-wood tree falls. The forest over which their depredations extend is a sorry sight; all the seedlings of the hard-wood are choked by the soft-wood growth which cumbers the ground.

Shingle-splitting is chiefly confined to Portuguese; and as their work is done on mature wallaba no great harm is done. But they sometimes combine charcoal-burning with shingle-splitting, and then they are most destructive.

A few proprietors of sugar-estates take out grants for cutting wood for fuel, and when this is the case everything falls before the axe. What are known as second-growths along reaches of the river are due to this destruction of the original forest.

From all accounts balata-bleeding is an industry which is spreading to a considerable extent, and by some it is said to leave havoc in its track; for the trees exhausted of the sap are attacked and killed by dry rot. This may be so, and the matured balata or bullet-tree may be threatened with extinction. But it is a question whether such extinction must not be looked upon as compensated by the value of the balata-milk†; in other words the balata juice may be of quite as much value as the entire tree if placed in the market as timber. And whether the trees are milked or felled, the saplings will in due time replace the old trees.

Much good might be done by regulating the licenced wood-cutters, binding them not to exhaust the

† The writer has evidently overlooked the easily demonstrated fact that balata-milk may be perfectly easily extracted without felling or in any way permanently injuring the tree.—Ed.

forest of trees under 12 inches diameter, beyond a thinning that would leave a healthy young hard-wood tree to cover every 20 feet area of ground cut over. But the main difficulty seems to be the same which checks almost every attempt at developing the riches of the colony: the want of steady labourers at such rates of wages as would compete in the markets of the world against countries the people of which are compelled by nature to work hard and continuously. Wood for path- and bridge-making should be taken only from common trees which it would be an advantage to thin out. A territory should be marked off and assigned to the Indians on each of the great rivers, and they should be stopped from cutting small timber wholesale wherever they find a convenient spot at an easy distance from the rivers. Charcoal-burners, cord-wood cutters, and shingle-splitters should be compelled to leave a healthy hard-wood tree to cover every 20 square feet of ground.

On reference to McDermott's diary for last year it will be found that the value of exports is given as :—

Timber, 124,000 cubic feet, at 32c. ...	...$ 39,680
Charcoal, 40,211 barrels at 80c	... 32,168
Shingles (1870) 6,121,225 at $4 per 1000...	... 24,000
	$ 96,728
Double for use in colony ...	...$ 193,456

or under $200,000 for the gross value of the products of the forests; nor does this industry give a cent of direct revenue to the exchequer beyond the very trifling sum paid for licences. So that any creation of officers and offices would be a direct and undesirable tax upon the general revenue.

While timber is at its present price it would be idle to expect any direct assistance from those connected with that business. No doubt the present cost of production is enhanced by the distance that shipping timber has to be hauled, now that all within moderate reach of the main rivers and creeks has been used. But beyond the falls or rapids in the main rivers the forests are untouched, and it is a question for the Government to determine whether the time has not come for forcing a navigable channel through the various impediments which now practically close all the upper reaches of our rivers against navigation. Those who have seen the rivers in dry weather will readily believe that, by judicious use of dynamite, a free passage might be blasted through the majority of the so-called falls sufficient for ordinary flats to navigate for hundreds of miles beyond the present barriers; and thus the timber-lands and the country generally would be opened up. Steamers are even now subsidised to run a certain distance for the accommodation of a very sparse population and no production; but if the opening up of the country is really the aim of the Government then certainly the rendering of the upper reaches of the rivers navigable ought to be considered, and when the exports from this opened up country are such as to warrant additional outlay for conservation of the forests or otherwise, no doubt the supplies will be found. Without adding to the civil-list, an easy and it seems to me inexpensive remedy for prevention and detection, in addition to the valuable and well defined regulations of Mr. McTurk as to size of timber and periods of cutting, would be brought about by providing that permits should

be required to be taken out, and granted by any Revenue officer before timber could be legally disposed of, or possession taken. This need not be of any more inconvenient or impeding nature than the permits for the removal of rum. Holders of grants or licences should be obliged to keep a record of all timber squared and beached at their different landings. Each timber should be impressed with the owner's brand. A declaration as to any timber sold being the property of the seller, the grant on which it was cut, and the purchaser's name, would then establish such a record that a weekly or monthly return to the Revenue Officer of the district would enable him in the course of his visits to check fraud or falsification.

The registers required to be kept by the Crown Surveyor under sections 9 and 10 of Ordinance 1873 of all grants or licences of occupation held under a properly constituted or presumed title ought now to throw some light on what should form the different boundaries, and enable such steps as were then contemplated to be taken for putting all on a proper footing.

No. 3.—By George M. Pearce.

This subject is one of particular importance to a colony such as this, possessed of large quantities of valuable timber, the future extermination of which is threatened by the indiscriminate and careless felling of trees not yet come to maturity. The destruction of valuable young trees committed by that short-sighted, and as a rule, grossly ignorant class of men the wood-cutters, is almost incredible. When rollers are required, over which the already squared timber is to be dragged, no judgment is used as to what trees should be cut for that purpose. The nearest straight and round one is felled, without any thought whether that tree will or will not be of value in the future. Again, a very great many valuable trees are destroyed by the collectors of balata. These trees, as a rule, have arrived at maturity; but after the gum has been extracted they are left to rot. This is the more deplorable as a great deal of balata could be collected, if care and discrimination were used, with little or no injury to the growth of the trees.

It would be almost impossible to put a stop to the former of the two methods of destruction. The latter could be prevented, by prohibiting the exportation of balata; but I do not suggest that this should be done. The cost for perfect supervision to prevent the destruction of trees alluded to above would be a great deal more than the value of the timber they would ever give. However

a law might be made prohibiting the felling of such trees; and occasion might sometimes offer for the prosecution and punishment of persons committing such offence; and this might deter, if not prevent, wood-cutters and others from destroying valuable wood. A great deal can be done, in other respects, for the conservancy of the forests.

The Government might appoint a committee to be composed of six gentlemen of experience with regard to the forests of this colony; three Government officials, say Mr. WIGHT (Crown Surveyor), Mr. MCTURK (Special Magistrate), and Mr. CHALMERS (Assistant Crown Surveyor), and three gentlemen whose daily vocation is in the timber business, such as Mr. OUTRIDGE of Essequibo, and Messrs. PATTERSON and GEORGE COUCHMAN of Demerara. I only mention the names of these gentlemen as I happen to know they have had considerable experience as to our forests. This committee should classify all the different woods of value, stating the least square each class of timber should give when cut. The chief thing to be considered is its durability. They should also determine what trees may be cut as beams and spars; and all persons should be prohibited from cutting or selling any beams and spars not of the description permitted, or any timber of less size than that laid down by the committee.

There is one kind of wood which cannot well be protected by law, it being used for so many different and actually necessary purposes. I allude to wallaba, which serves for frames of houses, posts, beams, vat and paling staves, shingles, cordwood and charcoal.

It may be asked, how are we to be provided with

timber of small sizes if, for instance, the committee should decree that greenheart should not be cut at a less size than 8ins. by 8 ins., this wood being often required 6ins. by 6ins. and 7ins. by 7ins. The answer is: the forests contain a great many other good and durable trees which at maturity will give those sizes.

No doubt the selfish will say, with such restrictions the price of timber will rise tremendously; what do we care about the future? The price must of course rise, but there is plenty of room for this. Timber is now bought for a mere trifle, while but slight attention is being paid to quality. The quantity of timber exported has fallen off considerably owing to the bad quality of the timber shipped within the last few years. If such a law as is here proposed were in force, the quality of the wood would be vastly improved, and the demand for it would equal, and most probably surpass, the supply. It may be argued that the law proposed would be all very well for persons holding lands granted for a number of years by the Government, but that it would be an infringement of the rights of those holding private property in the forests. Even if it were so, the individuals whose rights might be threatened are merely a few idle and worthless squatters, whereas the benefit to be derived from such a measure, will be enduring and universal. I have been part proprietor of a large tract of forest for many years, and had such a law been in force as is here proposed, that land would have been worth a great deal more now than it is; for the person who leased, and those who stole timber from it could not have unscrupulously cut young and valuable trees,

as has been done to a great extent. These squatters, having no capital wherewith to employ sufficient labour, only cut small timber, beams, and spars, which can be easily transported; and the ownership of a small patch of land with little or no wood worth cutting on it gives them the opportunity of stealing timber &c. from lands belonging to the Government and other respectable proprietors. The law proposed would so restrict these men that they would have to turn their attention to some more honest and respectable way of earning their livelihood, and would thus be rather a blessing to them than otherwise.

Another great cause of the destruction of our forests is the burning of charcoal. It is a well-known fact, that where this is carried on everything is cut; and nothing but brushwood grows there afterwards. This industry cannot be forbidden; but to prevent its practice to a larger extent than the demand for it in the colony requires, a heavy export duty, prohibitive indeed, should be placed on it.

It is unnecessary to take fire-wood into consideration, as nearly all wood for that purpose is cut on the lower banks of the rivers and creeks, where scarcely any valuable trees grow. I would further suggest that the committee should decide how many years should elapse before persons be allowed to re-occupy a grant from which timber has already been cut.

Persons in charge of craft bringing any wood, beams, or spars, which have been classified, should be compelled to take such craft, say to Bartica Grove on the upper Essequibo, to Aurora and Vergenœgen on the

lower Essequibo, to Hyde Park on the Demerara, and to Schepmoed on the Berbice, at each of which places there is a police station. The officer in charge of each station should have authority to grant permits for the removal of the wood &c. so taken, stating the name of the agent or purchaser to whom such wood is being carried. These permits should be taken to officers to be appointed as supervisors of all timber, stationed say at Suddie and Fort Island for the Essequibo, Georgetown for the Demerara, and New Amsterdam for the Berbice River, and anywhere else necessary. These officers should countersign the permits before the timber is allowed to be delivered to the agents or purchasers; but these permits should not be considered a guarantee or release of the sellers, agents, or purchasers from being liable for any breach of the law as to size and description of wood mentioned in such permits. They would be a guide to the officer as to who brings, and to whom any timber &c. is taken. These officers should have a practical knowledge of the different kinds of wood, and be authorised to stop and examine any craft with timber &c., and to visit and examine any places where wood of any description may be. There should be some suitable place selected near where these officers are stationed, at which those persons bringing timber &c. and having neither agent nor purchaser, might keep their craft until purchasers were found. Penalties should be inflicted on any persons convicted of purchasing timber &c. without a permit signed by a supervisor, and the wood should be confiscated.

I have not mentioned the names of any places where

permits might be given and supervisors stationed on the Corentyn river, and such creeks as the Mahaica, &c., as I am not acquainted with those districts.

A Journey to Mount Russell in Guiana.

By the Editor.

ON Monday the 21st of August, 1882, at 5 o'clock in the afternoon everything, with but one exception, was ready for the journey which Mr. PERCIVAL, the Principal of the Queen's College, and I were to make to the one notable mountain in this, the Pomeroon district, the most level part of all the level land of Guiana. The one want which kept us standing by the loaded boat at the water-side at Maccasseema was of our guide, an Ackawoi Indian named Daniel.

Toward the end of the previous year a writer in one of our colonial newspapers had announced his discovery of a mountain, 1000 ft. high, far up the Pomeroon River, or rather the Issororo, which is a large tributary of the Pomeroon, in the northernmost district of British Guiana. To this mountain the discoverer had given the name of Mount Russell. Its interest lies chiefly in the facts that in this flat coastland of Guiana any ground rising higher than a mole-hill is attractive from its rarity, that gold is said to exist in, or in the neighbourhood of the mountain, and that, because it lies so far removed from the parts visited even by Indians that no rumour had been heard, nor had any human being knowledge, of its existence until its discoverer chancing, in search of gold, to follow the Issororo up to its head-waters saw it some nine

months before our visit, it seems yet half covered by a certain mysterious and romantic veil.

The Pomeroon, about fifty miles from the sea, is formed by the union of two considerable and nearly equal branches, of which the one flowing most from the west is the Pomeroon proper, the other is the Issororo. Seaward from this junction the river is inhabited by Indians of various tribes; but of the separate streams, the Pomeroon proper is inhabited only by Caribs (True Caribs), the Issororo only by Ackawois.

The Issororo is navigable for, at the most, four or five hours' journey above its junction with the Pomeroon, and even so far is navigable only by free expenditure of labour with axe and cutlass, and by sometimes hauling the canoe, if of any size, on dry land past certain obstacles, and by sometimes lifting it bodily over others which lie across the stream. Yet notwithstanding these difficulties, a few Ackawois live scattered up to the limit of navigation, and a few others, yet more remote, live in houses to be reached only walking for hours, along barely marked paths, far into the forest. And of all the Indians who choose to live in such curiously secluded places our missing guide, DANIEL, lives furthest from civilization, on the very border of the district which had been avoided and untrodden by man until visited by the discoverer of Mount Russell. To this explorer DANIEL had acted as guide; and on the one occasion on which the mountain had been visited between its discovery and our visit, DANIEL had again acted in the same capacity. And this same DANIEL, who was on a visit at a place a little lower down the Pomeroon than my house, had now

promised to come in good time and act as our guide. But the boat was waiting, night meanwhile fast creeping nearer, and there was no sign of DANIEL.

So, there being no help for it, we went down stream to fetch our guide, and found him lying smoking in his hammock regardless, as is ever the habit of Indians, of time and of us, but perfectly willing and ready to come. Then, about six o'clock, we really started on our journey up stream.

It was a splendid moonlight night, which is certainly the most favourable opportunity to see a tropical river. In the day time, the more splendid masses of the trees and the grander and more striking foliage is too evidently mixed with much of less noble character, and the whole effect is weakened and confused by this and by the general meanness and untidiness of the smaller features of tropical vegetation. But at night, when the tropical moon—a thing in itself far too splendid to be more than faintly realized but by experience—is at its brightest, then the leaves which individually are the grandest and the hugest, such as those of palms and of wild plantains (*Heliconia* and *Ravenala*), and the trees most distinguished by nobility of mass, such as the mora (*M. excelsa*), and the more regularly curtained creepers, are brought into utmost prominence and shown in sharpest out-line, while all meaner and smaller matter is merged in shadow masses of such blackness as serves, by wonderful contrast, to throw up and emphasize the brighter points. It was a night when blackest shadows and whitest lights were each most intense, that we travelled, between walls of splendidly massed lights and shades

piled high on either side of the river ; while over all was the broad path of dark steel-blue sky, everywhere set with numberless stars, its space unbroken except where some manicole (*Euterpe edulis*), most lightly graceful in form of all the palms of Guiana, springing out and up from the forest walls showed like fine black tracery against the sky, or when, as not seldom happens in such tropical regions, the stately quiet of the sky itself was instantly disturbed by the hurry of a flashing meteor.

In such still and beautiful night scenes as these the scent of flowering tree and shrub and creeper fills the air more fully and yet more pleasantly than by day. And the ceaseless chorus of frogs, of many kinds and as many voices, and even the occasional scream of some other animal—weird because its origin is unknown and may most freely be imagined—seems, not noise, but rather serves to mark the absence of all other sound, and thus fully to complete the perfect stillness of the night.

As we passed up the river that night, a strange whistling sound, prolonged and very low, was pronounced by our boat-hands to be the cry of a "red tiger," that is a puma.

About an hour after midnight the moon sank; and about the same time, we having then been for some time in the Issororo, we came into such narrow and winding reaches of that river that, after spending another hour in running the bow of the canoe against fallen trees and into the river bank, we camped where a few yards of dry ground, raised a few inches above the the troolie-swamp which almost everywhere edges the river, gave opportunity.

Next day our onward course in daylight showed us the Issororo as a narrow stream between tree-walls not over-arching and yet very much higher than is usual in rivers so narrow, showed us—as indeed we had painfully experienced the previous night—that it wound much; and now it began to be too often interrupted by trees which had fallen, with picturesque but unpleasant effect, across its whole width. Sometimes these trees had to be cut through to allow the passage of our canoe, which, though not large, was yet larger than those generally used by the Indians of this river; sometimes it was possible to lift the boat, perhaps partially released of its load, right over the obstacle; once we had to drag it over land.

It was while the canoe was out of the water on this last occasion that I found for the first time wild in Guiana a plant which I had seen before in gardens, and which has often been said to occur in Guiana, though as far as I know no distinct locality has pefore been certainly recorded. This was a *Brownea*, perhaps the finest, with the exception of the *Victoria regia* and of a *Gustavia* of which I hope to say more on a future occasion, of all the many splendid flowers of Guiana. The tree, at least the examples of it which I saw, is insignificant and untidy in its wild state, but cultivated it has considerable beauty; but whether the plant be wild or cultivated, the large down-hanging cluster of thickset gleaming crimson blossoms is very striking. Some of my boat hands who belong to the Morooca river, said that it was common enough there, and they gave it the name of *atarno* which is certainly

somewhat a contrast to its common-place scientific name of *Brownea*.*

At last, about noon, all obstacles having been overcome, we reached the water-side of an Ackawoi Indian, an old acquaintance of mine, who always insists that his name is not Cameron, but Mr. Cameron. Beyond this point the canoe could not pass up the river; so from there we were to walk.

We determined to camp where we were for the night, under the trees, Mr. Cameron's house having lost all but about one eighth of its roof and being, more-over, decidedly dirty. But during the afternoon a very heavy thunder-storm swept over us and, lasting some time, flooded the whole country. Driven to seek shelter, but unwilling to accept Mr. CAMERON'S hospitality as either sufficient or comfortable, we pressed on for half an hour through the forest, along the path to Mount Russell, till we reached the settlement of one MARK, which afforded us shelter for the night.

Uncomfortable as the storm was on the day of its occurrence, its effect on our comfort the next day was yet worse. For, soon after starting in the morning, we came to a place where ordinarily is a swamp but from where on that day a sheet of turbid bush water, stretching from where we stood, disgusted, at its edge for an unknown distance away among the trees, covered our path. But there being no help for it, we plunged in and waded, more or less continously, for perhaps an hour, through water sometimes only up to our knees but often above our hips. The path

* I have since found this plant in abundance on the Morooca.

was soon lost, and in our efforts to regain it the party soon separated. Only after about two hours did we reassemble and compare notes. Some had endeavoured to avoid the deeper parts of the water by using the fallen tree-trunks as bridges; of these at least one had been rewarded by slipping off more than once and falling bodily into the flood, these accidents being in no small degree due to the fact that he to whom they befell had picked up a large tortoise during the course of his journey and centred too much of his attention on frantic efforts to carry the beast with him. One Indian boy who had been separated from everyone else explained that he had lost not only the path but also his trousers in the flood.

However, being all once more together, we resumed our way. The land being now somewhat higher, it was only occasionally that we passed through small reaches of the flood. Once we came to the Issororo, here shallow but still some fifty feet broad. The path crosses the river here on a felled tree, ordinarily some three feet above the water, but now some two feet under the surface of the flood, which was rushing over it at no mean rate. A thin bush-rope, about the size of thick twine, was stretched from bank to bank directly over the submerged and hidden log. Guiding ourselves by this, we had to feel our way with our feet through the flood to the other side. About an hour after passing this obstacle we reached the settlement where is the house of our guide Daniel, the most remote of any in that direction. Wearied by the walk, which had occupied some five hours instead of three

which would have been about its duration but for the thunder storm, we remained where we were for the night.

That afternoon the Indians of the place, seeing our interest in catching butterflies exhibited various clever ways of entrapping these insects. To catch those of yellow hue they picked and laid on the ground the flowers of a yellow bignonia (*B. chicka*); and this proved a most successful plan. Equally successful were they when they laid decaying banana-skins on the ground to attract the large blue *Morphos*; but an attempt to attract certain red species by displaying the ripe red fruit of the faroah plant (*Bixa orellana*) was not successful. Then, these methods of enticing the insects were completed by inverting a round quake (a wide-mouthed basket of very open wicker-work) over the bait, taking care to raise the quake so that its lower edge was some inches from the ground. The butterflies attracted by the flowers, made their way under the raised edge of the quake, and when the Indians approached flew, not out under the edge of the quake, but upward into the top, where they were captured.

Three hours walking the next day, through forest which cannot be called pathless only because there was some sort of track, generally but not always just discernible to Indian eyes, where the two parties which had previously visited Mount Russell had passed, brought us to a place on the side of a hill, overlooking a deep tree-lined valley, where two or three trees had been cleared away and two benabs erected by our precursors.

Here our Indians manifested what was for them unusual excitement, and stood gazing out across the valley at the slope which rose on the other side, pointing, at apparently about the height at which we ourselves were standing, into the thick rainy mist which had been driving over the top of the forest all that morning. There, the guide said, was Mount Russell; and he was very anxious that we should at once ascend it. But, not anticipating much pleasure from going up a mountain in thick mist, we waited where we were till the next morning.

Before long the mist rose, and through the arch formed by the two trees closest to us we saw the long flat-topped mountain, everywhere thickly covered with trees except where, near its summit, two bare cliffs rose above the trees of the lower slope, while they themselves were crowned by flat tops, also tree-covered. It was a pretty picture and one unusual in Guiana; but anywhere else the mountain would have been called a hill—perhaps 'Russell Rise' or, as a legendary ARTHUR has his seat at Edinburgh, so in future ages might the then legendary 'Sugar King' give his name to 'Russell's Seat.'

The ascent next day was short but stiff. Between our camp and the mountain lay not, as, misled by the thickness of the forest, we had thought, one valley, but three valleys, beyond the last of which the mountain sloped upward, at first gradually, its lower part being littered by huge broken granite boulders, on the top of some of which timber trees had rooted and grown huge where apparently was no earth till now they

rose, true giants, as straight as columns from their rocky pedestals. Half way up we came to the foot of one of the cliffs which we had seen on the previous day; but passing for a short distance along its base we soon found a very obvious and sufficiently easy natural upward path; and this soon led us to the summit.

The top is quite flat and covered by primeval forest, which, but for the rare feature of a few scattered granite boulders, is almost exactly like that which everywhere covers the vast lowlands of Guiana. As we made our way through this forest, the trees and undergrowth were sufficiently dense to shut out all view but of the nearest few yards on either hand; so that but for the memory of the steep ascent which we had just made, en-enforced by a certain shortness of breath excusable in Guianese mountain-climbers, we might have been on the ordinary plain of Guiana. There were the same trees, though these were perhaps somewhat unusually stunted, the same creepers, though these were perhaps even more abundant than usual, nearly the same ferns and herbaceous plants, and these about as sparse as usual. To me, having been drawn into undertaking this journey chiefly in the hope of finding on this comparatively high plateau a vegetation, if not entirely distinct, yet somewhat different from that prevalent on the normal forest lowlands of Guiana, there was considerable disappointment.

Yet there were a few new and interesting plants; one or two ferns which I found either on the way up or on the top, and one or two new orchids. One epiphytal orchid, not then in flower, but probably

an *Epidendron*, was very common on the boulders;* and another, this time a terrestrial orchid, either a *Spiranthes* or very closely allied to that genus, was not only more striking in appearance than most of this comparatively insignificant genus but surpassed every other orchid known to me, without exception, in the excellence of its scent. The only other species of the genus known to me in Guiana is found, not uncommonly, in the sandy soil where moras grow; it is very insignificant in appearance and it smells, oddly enough, much as do cockroaches. But this second species, from Mount Russell, is readily distinguishable by its considerably greater size, by the rich creamy white colour of its blossoms, and as being one of the sweetest scented flowers known to me; we agreed that its scent is exactly like that of the plant familiarly known as lemon-scented verbena; yet it was much more more powerful and at the same time more delicate. One plant of this fine orchid had the further attraction of prettily variegated leaves. †

At last we broke through the bush on the edge of the cliff. The sight we saw was certainly wonderful and unusual in Guiana. Far below, from the foot of the precipice on which we stood, as far as the eye could reach lay one enormous tree-covered plain with nowhere a break, even of a few yards in the very many miles which lay in our sight, in the vast sheet of leafage. To

* The plant has since flowered in my garden. It proves to be an *Epidendron*, unseen by me elsewhere in the colony, but with only a small, insignificant white flower.

† I am glad to say that I now have both the plain and variegated forms of this orchid in a growing state.

the north east a range of scattered hills appeared of about equal height to that on which we stood and were at any rate not so high and not so distant but that we could see the level plain extending far beyond them : and these hills too were tree-covered. Again, to the south east a single hill of about the same height and character and equally tree-covered showed. And the wonderfully striking monotony of this limitless and almost level plain was broken only by rain-storms which moved swiftly over the face of the country and by the ever moving, ever changing shadows of passing clouds.

The height on which we stood was probably about eight hundred feet.

Returning down the hill to the camp, we remained there yet another night. The Indians were timid of wandering alone through this part of the forest, as they declared that they saw signs of many Waikas about. Now Waikas are wild Indians who go about to kill ordinary Indians. Game, however, was abundant near our camp and so we got all we wanted without wandering far a-field.

Of the return journey very little need be said. The flood had subsided, and the walk was accomplished much more speedily and easily than when we went. We reached Maccasseema in exactly seven days, to the very hour, from the time at which we left it. The whole expedition might be made, with good luck, in five days; but it might then be somewhat fatiguing. Under any circumstances the journey to Mount Russell would never be easy to those unaccustomed to bush

travelling, and even when the mountain is reached, the result hardly repays the labour.

Remarks on the Aspect and Flora of the Kaieteur Savannah.

By G. S. Jenman, F.L.S., Government Botanist of British Guiana.

THE Kaieteur Savannah, which partly skirts for two or three miles the Potaro river—without, however, running parallel with it—within a narrow belt of river-bank vegetation, mostly forest of unequal depth, lies in 59° 19′ west longitude and 5° 8′ north latitude, immediately behind to the right of the Kaieteur, and forms a small part of the broad table-land which heads, and in a measure flanks, the great valley through which the Potaro runs a considerable portion of its way on the lower reaches toward its confluence with the Couriebrong and Essequibo rivers. On the north-east side, looked at from the river, the savannah abruptly terminates in conglomerate rock, intersected by deep and wide fissures, and by patches of broken woodland vegetation; and the land drops a perpendicular depth of a thousand feet, thereby producing the wonderful water-fall known by its Indian name of Kaieteur. With regard to the name, I may remark that I closely questioned several of the inhabitants of the region as to its pronunciation, and there is no doubt that they sound it Kaietouck or perhaps Kaietout; for in this and many other such names a faint *k* or *t* seems used somewhat indeterminately. But as C. B. BROWN spread the fame of the fall, and other writers have followed him,

under the name of Kaieteur, it is perhaps better to retain this form. Apart from the Kaieteur and the inexpressible effect which it produces on the beholder, the outlook down the valley from the brow of the fall, or from the higher land I have just described, is, in my estimation of scenery, of unsurpassed grandeur. To this however I can only allude, and must turn to the subject of the savannah and its flora; but having once seen it, it can never again be shut out of the beholder's eyes.

The savannah, the flora of which I shall alone deal with here, though my labours on the occasion of my journey thither were not confined to it, has a nearly even surface, but with a slight decline toward the bed of the river; and it is surrounded and well shut in on all but the valley outlet by dense, more or less, heavy forest. The outlying region around, as far as the eye can reach, which from the south-eastern part, looking south and southwest, is very many miles in extent, has also similar heavy forest. The nearest open ground which the Indians appear acquainted with, they state to be four days' journey on foot from the settlement of Chienabowa, which is two days' journey by canoe above the Kaieteur, on a rapid-flowing, unnavigable tributary of the Potaro, which gives its name to the settlement. Being thus isolated, it is not surprising that the flora of the Kaieteur Savannah is, to a large degree, of a peculiar and consequently interesting nature, compared with those of the larger savannahs of the colony, all of which possess broad features in common.

Looking first at the soil and the underlying geological formation, on which (allowing for climatic conditions)

the character of the vegetation in any particular region very much depends, the composition of the surface is found to vary from a dark humus accumulated in the low-lying parts, to a thin coating of sand and gravel in the upper, drained parts; all however rests on a sub-stratum of sandstone or conglomerate rock, which, except where the boggy humus lies, may be seen almost every-where protruding through the shallow covering. As might be inferred from this description of the ground, the vegetation is neither dense nor unintermittent over the greater part of the savannah. Stretches of open rock occur on which a tuft or two of grass or sedge may here and there be found, or a clusiad or bromeliad is lodged in a favorable crevice; or even, from some narrow fissure, into which its roots can penetrate, a stunted tree struggles against the inimical conditions; but the rocks are as often barren and bare. Wider areas of pure gravel almost as hard as concrete occur, or gravel with a slight admixture of sand; with tufts of half withered grass, patches of fern and low shrubs and, if wet, scattered dwarf herbaceous subjects, some of which are very tiny, partially clothing their surface. Distributed here and there in varying order—if order it may be called—some close together or running one into the other, with winding intricate path-ways between, others apart or widely separated by the morass—are small copses composed of trees ten to thirty feet high. Under their shade and among their roots leaf, and other vegetable mould has accumulated; and this sustains shrubs and smaller plants in great variety. In addition, these trees, as well as their near standing neighbours of the surrounding

forest, support a good deal of epiphytal and parasitic life, chiefly, however, of a hardy sunbearing character. At all times of the year except the latter part of the long dry season, water trickles over the surface generally. This and the organic matter gathered by its wash, with the natural decay in the localities affected, held in the hollow and lower parts of the ground, form a soft spongy, or more aqueous, soil, into which one sinks in walking, leaving open foot-holes that fill instantly with water. *Sphagnum* and other Mosses, *Lindsays,* different species of *Pæpalanthus, Abolbodas, Stegolepis, Lycopodiums* &c. are its principal occupants.

Evidence presents itself unmistakably that the savannah has been larger—probably much larger—in the past than it is at present. The nature of the growth which borders the forest demonstrates this. The forest, too, contains odd bits of savannah, which by reason of their barren soil-less condition have not yet become grown over. Its reduction is no doubt checked by the conflagations to which the Indians frequently subject it. A year or two prior to my visit, a great fire appears to have devastated all the lower part, leaving the evidence of charred stumps, and a thick layer of ashes as far as it extended. Within the savannah, the outline of the small trees and shrubs which border the forest is very irregular, and this more particularly along the upper side, where the dense thicket forms diffused reaches into the savannah, with deep-bay or ford-like openings gravel-covered and very sparsely clothed with any kind of herbage between them. The elevation of the region is from 1200 to 1300

feet above sea-level; and its maximum temperature in the hottest season of the year is 84 degs. Frht., while the minimum, which is experienced beween 5 and 6 o'clock a.m., at the same season is 64 degs. Frht., fluctuating however much more than the day temperature. The current of air blows up the valley, and during the night and early morning brings a cloud of mist up over the top of the Kaieteur. The average rainfall is probably not less than 100 inches annually, and, in common with the rest of the country, the district is visited by alternate wet and dry seasons twice in the year, each of which affects very materially the aspect of the vegetation of the savannah while it lasts.

My visit was made at the warmest season of the year, in September, and I arrived there during the last showers of the summer rainy season, and before any of the smaller herbaceous plants had withered and died, as they did later, under the influence of the autumn drought, quite changing by their absence the appearance of the ground where they grew. I made a complete collection of the vegetation in flower at the period, which, under the favorable conditions which the weather and the locality, with its bare sun-heated rocks, presented for preserving specimens, took a fortnight to gather and dry.

The attention of the visitor is suddenly arrested on entering the savannah from the forest through which the path leads up from the landing at Tookooie, by the novel character and variety of the vegetation before him; but more particularly and especially, at first sight, by the peculiar aspect which it presents in the abundant presence and predominance of a single species— a bro-

meliad of gigantic growth—recently named and published by Mr. BAKER, from the material which I gathered, *Brocchinia cordylinoides*. Probably half the space here occupied by vegetation is in possession of this remarkable plant which, so far as is at present known, is confined to this savannah and the near surroundings of the Kaieteur, unless, indeed, a plant to which I shall have occasion to allude again later on, discovered by GARDNER, in an arid, rocky part of the Organ Mountains, Brazil, which, however, he did not identify, is the same species. The history of our knowledge of it is very brief and may be told in two or three words. With the great waterfall around which it is localised, it was discovered by the geologist C. B. BROWN, and noticed in his report of the discovery of the Kaieteur. Some years later it was photographed by Mr. IM THURN *in situ*, who gathered flowering sprigs, which however appear to have been imperfect for botanical determination and led to its publication under the genus *Cordyline*.* It has a stem as stout as one's thigh, which grows erect and eventually reaches a height of fifteen feet in sheltered situations. The leaves never part from the stem, but in course of time decay, their fibrous bases always remaining. The head forms a dense plume the size of one of the largest *Agaves* or *Fourcroyas*, but with three or four times the quantity of foliage possessed by any member of those genera. The dead leaves hang down, lapping closely one over the other on the stem, which, in specimens only a few feet high, they

* The few pieces of flower I gathered were literally all I could find at the time, which was in November, 1878, after a drought which had lasted, with very insignificant interruptions, for two years.—ED.

quite hide; and these examples often present the curious, illusive spectacle of two plants with their stems cut off standing one on the other, the under one reversed and dead. It flowers at various sizes, depending absolutely on whether the situation be favourable or not to healthy development. The age when this takes place, I found nothing to enable me to determine. It is so many years, however, that this *Brocchinia* might be regarded according to the popular fallacy concerning the *Agaves* as a "century plant." The panicle is several feet high, much branched, with pale inconspicuous flowers. In the performance of the reproductive function the plant dies.

A second new species of *Brocchinia*, lacking the interest which imposing proportions secure, and indeed a peculiar contrast to the last in every detail of habit, yet a very striking plant too, is principally confined to the marshy or very wet ground of the central region of the savannah. Unlike the former, moreover, it is not gregarious, but is scattered all over the open swamp. Its habit, too, is singular. Each plant stands alone, stiffly erect, about eighteen inches high, with no apparent stem above ground, and convolute equally from bottom to top like a roll of paper. Only two or three leaves are developed, two of which, the outer ones, are invariably of equal size. This accounts for the convolute habit, whereby the plants appear as so many stakes cut to a length and driven here and there into the ground. If several leaves were developed the outer ones would necessarily have to spread more or less from the axis to give room to those

within. Here there is an early arrest in the growth of the two or three heart leaves, with a wonderful and abnormal development of the external ones, which stand erect and clasp each other, forming a well-shaped tube. From the exceptional habit and plentiful distribution of this plant the savannah derives one of its most memorable features. *Brocchinia* has hitherto been a little known genus, established on a single West Indian plant, found in St. Kitts and Dominica.

Yet a third new bromeliad inhabits the savannah, not of the same genus as the two preceding, but not less deserving of notice for its exceptional character. I allude to *Æchmea brassicoides,* Baker, which is found plentifully on the weather-beaten rocks and boulders of the brows and walls of the great precipices on either hand of the Kaieteur, and is, as well, very abundant on the ground and the trunks of trees in the drier parts of the savannah, apparently requiring full exposure to the sun and arid conditions of life for its growth. It has a ligneous creeping rhizome, which spreads and branches freely, forming in favorable places quite a net-work, adhering to the surface. At intervals as the rhizome develops, buds are thrown up, which when full grown assume the form of well turned-in hearts of spring cabbage. The leaves are of two kinds, distinct from each other in form, texture, colour, armature and habit. Those of the outer series spread flatly on the ground or other supporting surface; they are narrowly oblong but abruptly dilated at the base, prickly on the margins, and in substance leathery; while the inner ones are erect, plain on the edges, oval and

hood-shaped, lapping over each other so rigidly that, at the flowering period, instead of separating with the pressure of the developing flower stem, they are pierced right through by it; so that if a plant in this condition be cut through at the base, they hang on the stem like so many fish threaded on a stick to be smoked or dried. These three plants, associated as they are by intimate alliance, form together, though in very unequal degrees, one of the chief of those features the combination of which gives that individuality which I have characterised as striking and interesting in this savannah flora.

A remarkable feature of this flora, which strikes the observer very early, is the free combination within so limited an area of marsh and dry-land subjects, some of which submit to both conditions indifferently and thrive equally well under either. The large *Brocchinia*, to mention the most conspicuous example, is of the latter class. It is found under the widest extremes of conditions as to soil and moisture, and all the intermediate modifications which these conditions present. In the soft aqueous ground which in wet weather is flooded, in the apparently impoverished water-washed gravel, and on the bare sun-heated rock it abounds alike plentifully. It cannot of course be said of this region, that plants which adhere to naked rocks live without moisture, as the daily recurring mists and frequent rains supply this.

Of plants the least plastic in their habits, and which here confine their range to the dry ground, the numerous species of *Clusia* form, if not a predominant, at least a singular feature. Their variety is so great that their

study alone would occupy one's time on the ground for several weeks together. Resembling each other closely in leaf and general habit, they yet exhibit both remarkable unity and diversity in other characters. In flower and fruit the different species vary much one from another. On the form and character of the fruit, good distinguishing characters might be based ; but as they are rarely found in flower and fruit at the same time, the field is the only place in which they can be studied satisfactorily. Of about a dozen species which I gathered in bloom, only two were in fruit. They prevail largely on all the dry rocky or gravelly parts of the savannah, and no one would suspect from the hold they have of the ground, that in situations more favourable to general plant development, they prefer to live on the trunks and branches of trees. A species of *Moronobea,* another genus of this same family, has perhaps the most striking flowers of the many interesting plants I came across on my journey. It is a new species, and is common on the higher ground on the edge of the forest, growing erect and tall, from ten to thirty feet high. A tree seen in bloom in external appearance is not unlike *Magnolia grandiflora.* The flower, a pure white, but with an offensive odour, is the largest known to me of any western tropical plant except only the *Victoria regia.* The wood when cut exudes a yellow juice of an adhesive nature.

The savannah is crossed diagonally by a rather faint trail which the Indians use, on the few occasions they pass up or down the river, to avoid the Kaieteur, and about halfway down this path, among the low bushes which are there dispersed over the ground, occurs a

pretty dwarf shrub, a foot or eighteen inches high, with leathery oblanceolate glossy leaves, and small, clustered white flowers. It appears to vary much, and I gathered several of the forms. It proved to be a new and very interesting species of *Simaruba*, and Professor OLIVER has figured it in the *Icones Plantarum*, and named it *S. monophylla*. About the same part of the savannah, I found a new and showy flowered leguminous shrub of which, I regret, I failed to obtain seeds, the season being too early. It is referred approximately at Kew to the genus *Dicymbe,* which, so far, is only known by one species from Venezuela. It has pinnate 4-jugate leaves, terminal clusters of large, white, densely ciliate flowers, with long excerted stamens.

More widely diffused over the savannah is a new species of *Dimorphandra,* which I still more appreciate as a subject for cultivation. It has a low spreading head of the habit of the well-known *Poinciana regia,* with densely flowered spikes of pinkish bloom, and all its parts except the upper surface of the little leaflets are covered with a bright brown silky pubescence. My visit was just in advance of its flowering season, but fortunately one tree was discovered in bloom before I left, and I likewise had the gratification, after many days' search, to find a couple of ripe pods, which produced good seed, from which I have raised plants.

Some of the subjects which inhabit this savannah are exceedingly rare, as well as geographically local, two or three of which I may mention. Over the Kaieteur there grew and bloomed in a fissure of the rock, the only tree I found of the beautiful white flowered *Cosmibuena triflora*. I hesi-

tated, because of its dangerous position and slender form to send a man up it for specimens; and when he ascended and it swayed with his weight out over the awful chasm beneath, I trembled for what then seemed to me the great folly of my conduct. However, he got down safely, and indeed declined to return till he had secured an armful of the branches. The flowers have long tubes like those of *Posoqueria longiflora,* but stiff enough to be erect. One of the highest trees of the open savannah, which I had cut down to get at the bloom, proved to be a probably new species of *Plumieria.* Three or four members of this genus * are among the principal ornaments of western tropical towns and gardens, and this new species is hardly inferior to them in plentiful and showy bloom; but it is a much larger growing tree. Its milk-like juice, which flowed so copiously as to spurt into my face as I stood near while it was being felled, I found intensely acrid. I saw only this individual tree.

Among the smaller shrubs which fill the copses, hang on the skirts, or straggle loosely over the more open parts, of the savannah, are several species of *Gomphia.* I gathered about a dozen, the greater part of which, strange to relate, proved new to the best herbarium in the world—that at Kew. They are mainly woody plants, a few feet high, with flowers of a whitish or pale yellow colour. That so many of them had never before been collected in the colony, is further proof of the exceptional character of the Kaieteur savannah flora. I gathered also two forms of *Turnera rupestris,* Aublet, which ap-

* Commonly called *frangipanni.*

peared to me distinct by their difference in habit, but which at Kew they regard as inseparable. AUBLET figured one of them in his *Plantes de la Guiane,* but only one European herbarium contained a specimen previous to my expedition.

In the broken woodland over the left arm of the precipice which extends from the fall, there grows one of the best Guiana plants, regarded from a floral point of view. It is a shrub or small tree belonging to *Rubiaceæ,* named *Isertia hypoleuca,* Benth., with beautiful soft scarlet ixora-like flowers, produced in wonderful masses, and great abundance. Few cultivated plants could rival its effectiveness. From this position, looking down into the valley below the Kaieteur, the white bloom of *Ferdinandia rudgioides,* Willd, was everywhere observable, on what appeared shrubs a few feet high. I found later that these were in reality trees of a considerable size.

Melastomaceæ, in number of species, are not plentiful in this flora. Only three were in bloom, and but one of these occurred commonly. This is scattered over the open face of the savannah and charms one with its beautiful foliage and flowers. These characters and its dwarf habit make it a desirable subject either for garden or stove cultivation. In the less open parts, and less plentifully, *Comolia surinamensis,* Miq., is found. *C. microphylla,* with proportionately large flowers, is a pretty little rock plant only a few inches high. Among the shrubs which in situations more favorable to growth would attain the size of small trees is a *Swartzia* deserving of notice for its attractive yellow flowers, as does also *Cyrilla antillana,* with copious

racemes of white bloom, as being the commonest shrub on the savannah.

Only one species of *Palmæ* inhabits spontaneously the savannah, though a second is here and there found on its skirts. The latter is the *carana* of the Indians, *Mauritia aculeata* of botanists. I regretted very much that no fruit was obtainable of a plant it would be so desirable to introduce to cultivation; nor could I find any seedlings which I might have lifted and brought with me. It throws up many slender stems, fiercely beset with woody spines which dwindle in size as the stem ascends till they become mere warts. The leaves are fan-shaped, on unarmed petioles from the axils of which the pinnately branched inflorescence springs. The other, which is common at intervals over the fully exposed part of the savannah, is one of the so-called pimplers,—a term applied by the river residents to all the slender prickly palms, for which, in most cases, the Indians have no distinguishing names. It is a species very widely diffused over the colony, and, growing on rich land by the rivers, is the finest member of the genus in Guiana; but on the Kaieteur savannah it presents a stunted weather-beaten, bleached, appearance. Specimens of this plant, gathered on the Corentyn river by Mr. IM THURN and myself, submitted to Dr. TRAIL, who has made a close study of Brazilian palms, he made the types of a new species under the name of *Bactris leptocarpa*, Trail. On the upper reach of the Lamaha canal which was opened last year, where it abounds, its panicles of red fruit when in season are a conspicuous feature seen among the trees from the canal.

Among the plants which are the pioneers of the forest in its steady encroachment on the savannah there are two that, by their predominance, play a principal part, which I must briefly notice before I quit the review of the arboreal part of the vegetation. They are *Bonnetia sessilis* and *Archytoca triflora,* highly characteristic trees. Along the skirt of the forest where it slopes from the fully developed members within, through younger growth, to the open ground, these form the bulk of the vegetation. From the quality of their bloom, too, they are both plants meriting particular attention. The white floral leaves and bracts under the pink flowers of *Archytoca* make it a singular and conspicuous object everywhere, particularly where it is most abundant and the associated trees appear massed together for effect. The red bloom of *Bonnetia,* if less effective at a distance, when seen within a few yards is more beautiful still.

Turning now to the large variety of herbaceous vegeation which grows intermingled, to a large degree, with the foregoing plants, under the conditions required or attainable by each, there is found much to afford interest and pleasure to the investigator. Wandering through thickets of the great *Brocchinia* I was puzzled to observe tall lax panicles of, what appeared at a distance, pea-formed flowers, rising three or four feet and spreading from among its leaves. These proved to be the flowering stems of an aquatic plant subsisting in the water contained in the axils of the leaves of the *Brocchinia,* which, like some other *Bromeliaceæ,* conserves in the pockets formed of the bases of

the close-sheathing leaves, through nearly all seasons, much moisture gathered from rain and dew. It turned out to be the large and curious *Utricularia Humboldtii*, the most showy and interesting of all the dozen members of the genus which I gathered on my journey. As, after a very vigilant search over the savannah, no plant was discovered in any other situation, I was disposed to regard it as inseparable from the *karwatsa*, as the Indians call the *Brocchinia*, but I find that SCHOMBURGK gathered it at Roraima, and other collectors further south. Few of my discoveries delighted me so much as this when I realised the real conditions of its existence, but at first I stood for a moment puzzled beyond measure to account for the gay flowers apparently, and yet not possibly, the production of the *karwatsa*. Supposing for a moment that plants possess sentient feeling, it must be admitted they often appear to take mean advantage of one another in securing to themselves good conditions of life, for which they seem to strive in a quiet but very effectual way to gain or sacrifice every interest previously possessed by a neighbour, yielding nothing in return; but to such imagined selfishness this *Utricularia* is a chivalrous exception. Without injuring in the least the great plant which supports its life, it lifts its stems high and throws the glory of its beautiful bloom over the broad pallid head that has afforded it a home.

A parallel case, of plants nearly allied to these, is mentioned by GARDNER in his "Travels in the Interior of Brazil," to which I have already adverted as indicating the possible identification of one of them with *Brocchinia cordylinoides*. He says :—"I collected...........a very

extraordinary species of *Utricularia*...to which I have given the name *U. nelumbœfolia.* Like most of its congeners, it is aquatic; but what is most curious is, that, it is only to be found growing in the water which collects in the bottom of the leaves of a large *Tillandsia* that inhabits abundantly an arid rocky part of the mountains at an elevation of obout 5,000 feet above the level of the sea...............The leaves, which are peltate, measure upwards of three inches across, and the flowering stem, which is upwards of two feet long, bears numerous large purple flowers." Nearly all, if not absolutely all, the *Utricularias* bear little bladders plentifully, either on the floating leaves or on slender thread-like rhizomes which push through the water or soft mud in which they grow, a character which invests them with peculiar interest. DARWIN and others have shown that these organs are contrived as traps to capture minute insects. In his "Insectiverous Plants," DARWIN particularly has described very minutely the cells and their functions in imprisoning and absorbing animal prey. In the purely aquatic species, the leaves of which float in the water and are cut into acicular filaments, the bladders are borne on the leaf; while those species which merely require moisture and grow usually in mud, and which possess variously shaped entire leaves, produce them on the slender rhizomes I have mentioned. To the latter class, though I found it in water, its roots, however, only submerged, *U. Humboldtii* belongs, and I gathered a mass of the threads bearing the singular bladders.

On the gravelly soil where moisture prevails long after the seasons' rains have ceased, a little rusty-coloured sun-dew, not larger than a small strawberry, is found scattered, mostly alone, where the ground trends towards the fall. It is among the very smallest of the objects which clothe the ground, and, being not unlike the pebbles among which it grows, is not readily detected. It acquires its chief interest as a local congener of the well-known British sun-dew, and is the smallest known to me, of the insectivorous or fly-trap plants, to the most remarkable class of which I have just alluded.

On similar ground, near by the sun-dew, but where *Sphagnum* has lived and died and formed in its change beds of vegetable matter in which numerous moisture-loving plants live, various species of *Pœpalanthus* grow in dense masses and, when in bloom, present a curiously exceptional feature. This is more especially so with *P. umbellatus*, in which the primary stems bear at the top long slender radiating pedicels which spread in every direction. I may remark, as another proof of the distinctness of this savannah flora, that *P. Shuaderi*, which has a stout woody stem crowned with a spreading tuft of fine grass-like leaves, which is common on many of the savannahs from the Corentyn to the Essequibo, and probably beyond the colony, is not found here. These *Sphagnum* beds are also occupied by two new species of *Stegolepis*—plants with long ensiform leaves, having broad but folded sheath-like and imbricating bases which, though they fit closely one on another, contain much mucous matter. The flowers are in globose heads on tall slender stems,

composed of short bracteate cones diverging from a common axis, with bright yellow petals. The leaves spread only right and left, so that the plants look like large fans stuck in the ground. With these, producing a very dense growth, are two species of *Abolboda*, the leaves and roots of which are said to be used for itch and leprosy. They are strictly marsh-plants, very near *Commelyneæ*, with pretty, but fugacious, blue flowers. The back-ground or centre of these groups is usually made up by clusters of the big *karwatsa*,* while the skirts, wherever a little soil exists, are decked with pretty bright-eyed *Sauvagesias* and dwarf *Utricularias*, among which, though not so plentifully, are such little subjects as *Burmannia bicolor, Polygala appressa Muroneria tenera* and a *Sipanea* near *acinifolia*,—all delicate bright-flowered things.

Especially in that part of the savannah lying west of the Kaieteur, a dwarf *Apocynaceous* plant abounds, with yew-like leaves and large yellow flowers resembling the bloom of some of the smaller flowered *Allamandas*. In the moist seasons of the year it contributes much to enliven the more bare and barren parts of the ground. The most casual observer would regard it as one of the characteristic features of the region. It bears the honoured name of Mr. BENTHAM (*Mandevillia Benthami*) whose life for the last sixty years, with singular patience and industry, has been devoted without reward

* The Indians I met on the savannah seemed to apply the name "*Karwat*," which they used in regard to several of the species I had gathered, to all, or nearly all, the *Bromeliaceæ*, and they did not uniformly distinguish the "*Karwatsa*," or large *Broochinia* by the addition of the final syllable.

to systematic botany, and whose genius and sagacity are unrivalled in the branch of the profession he has followed.

Just as one would infer from what I have said of the physical features of the surface, *Orchideæ* are rare. Near the fall are three or four species of *Sobralia*, some with white, and others with purple bloom, as large as that of *Cattleya superba*, but of a very fugacious character. How gay they look with their beautiful flowers, in their freedom and safety from all collectors, on the crags and interstices of the walls of the great precipices of the fall! Two of the species hug the Kaieteur and the dew-moistened ground near by very closely, and can hardly be regarded as any part of the savannah flora. There were, as well, two or three dull flowered species of *Epidendrum*, but the only other orchid of interest was *Epistephium parviflorum*, Lind., a more strictly terrestrial plant, whose roots penetrate the ground so deeply that I was unable to dig specimens with my cutlass. It has peculiarly interesting foliage, and purple flowers, neither so large nor so showy, however, as those of the *Sobralias*. *Vanilla palmarum* abounds in some of the copses, with brown sunburnt leaves and stems, and one or two small *Pleurothallis*. Among the big *Brocchinia* on the heated rocks with hardly any, if any, soil, a genus near *Catasetum* abounds in great plenty. One would think the plants were half roasted daily by the heat which the rocks absorb. During the winter rainy season they make their growth and flower. In August the tufts of erect fleshy bulbs drop their leaves, and they remain naked and inactive till December.

Though I purpose dealing in a future paper with the peculiar river-flora of the colony, there is one plant that prevails all the way from Pacatout to the rapids above the Kaieteur which I must notice because of a congener which I gathered on the savannah. It is a sedge with capitate crowded balls of white flowers on long stalks, and long narrow leaves. It grows submerged at the bottom of the river, and is only exposed when the water falls low, in the dry seasons, when it flowers. The savannah plant, of which I found but the individual I gathered, is more robust, with larger heads of flower and rigid serrated foliage. They are diœcious plants, and my specimens happen to be female of one species, and male of the other. Sir JOSEPH HOOKER has made them the types of a new genus which he has described for the *Genera Plantarum*, and placed, I believe, near *Typha*.

The ferns of the open savannah belong to three closely allied genera, *Lindsaya*, *Pteris* and *Blechnum*, though on the shady borders several others appear. The *Pteris* of course is the cosmopolitan *P. aquilina*, and the *Blechnum* the prevalent *B. serrulatum*. The *Lindsayas* are also the very common species, with one exception—the most beautiful of all the American *Lindsayas*.—*L pendula*.

Several other plants I had marked for notice, but these I must leave, all but one, and this only to settle a question which has been raised regarding it. On some of the trees a species of *Codonanthe* grows, with pendent limbs and white axillary bell-shaped flowers. Like several orchids in this country, it invariably grows in ant-nests,

the inhabitants of which henceforth become its fierce guardians against all depredators whatsoever, considering not even the praiseworthy collector. In gathering specimens of it I had to sit patiently by the bush and nip a flower between the raids the ants made to the remote tips of the leaves every time I touched the plant. The ant is a medium sized black creature, one of the most fierce and venomous of the family. It has been asked whether the nest in this case forms part of the plant, as in *Hydnophytum* and *Myrmecodia*, whose stems are tunnelled by sinuous passages by ants, which causes an abnormal enlargement of the part affected. No, in this instance, and those of the orchids I have alluded to, the plant simply lives in the material of which the nest is made; in which its roots seem to thrive, for they ramify freely and are carefully kept concealed by the crust of the nest.

In the next number of *Timehri* I hope to give a complete list of the Kaïeteur plants, when may also be published, I hope, some of the new species.

Valuable Curiosities from the British Guiana Post Office.

By Edward C. Luard.

SOME years ago there appeared in the *Times* a paragraph headed "Human folly". The lines beneath this announcement contained a brief report of an auction sale of used foreign postage stamps which had taken place at one of the principal auction rooms in London. A collection of these bits of paper had been broken up into lots and sold, the nett proceeds amounting to several hundreds of pounds. A single stamp, one of those first issued to, and used by, the British Guiana public, in 1850, fetched £35. It was a circular impression in black on primrose coloured *tissue* paper, bearing the words "British Guiana"—a most miserable specimen of design and execution, and the facial value was only four cents.

Now, I daresay many of us have read of the recent sale of the magnificent Hamilton collection; and we all know that old china, coins, and other curiosities of a by-gone day frequently fetch enormous prices, while to any but collectors, most of these things possess but a passing interest. For taking great trouble, and spending time and money in collecting the above, a man is not called a fool; but when he does the same in the pursuit of old postage stamps he is laughed at. We all take a great interest in this colony, loving it while we are here, and still more when we are absent; so if I put

down a few interesting, veritable facts concerning its old postage stamps, I hope I shall not share the same fate as the before mentioned stamp collectors.

It is only necessary to refer to the old issues of the colony's stamps, as those of later days, whether belonging to this or any other country, will never have a market value, such as that of the specimen alluded to in the *Times*. Postage stamps have of late years been diligently hoarded by dealers and collectors, and from the existing thousands they cannot become scarce. But between 1840–60 philately was in its infancy, and stamps were destroyed simultaneously with the envelopes they franked.

The issues I am about to speak about are then as follows:

1850 issue *(fig 1)*, name roughly printed in straggling circle, value in centre, black impression on coloured paper.

Fig. 1.

1. **Four cents, primrose, (this was printed on *tissue* paper.)**
2. **Two cents, pink**
3. **Four „ chrome-yellow**
4. **Eight „ green**
5. **Twelve „ indigo**
6. **Twelve „ clear blue.**

Of these there are certainly three types, possibly more. They are usually initialed in black ink, E. D. W., more rarely E. T. E. D., and occasionally are without any such surcharge. They appear to have been more patronized in Berbice than in Demerara, the few specimens I have seen nearly all bearing the post-mark of the sister county.

The next stamps that appeared were in 1851 (*fig* 2.)—

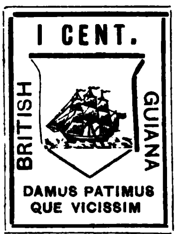


Fig 2.

A ship in shield, value above, name at sides, "Damus p*a*timus que vicissim" in two lines, black impression on coloured paper.

7. One cent, magenta
8. Four cents, blue.

They are of a long ungainly shape, peculiar from having the "petimus" misspelt "p*a*timus." This was, however, purely an engraver's error, the stamps having been produced by Messrs. WATERLOW & SONS of London. Several types exist of these stamps, as each specimen was separately engraved to form the sheet. They were reprinted in 1864 for a firm of stamp-dealers, on thicker paper, and perforated, as no original ever was.

I pass over an issue in 1853, as they are comparatively common, having been in use up to 1860.

In 1856 (*fig.* 3) some provisional postage stamps, now much sought after, made their appearance.

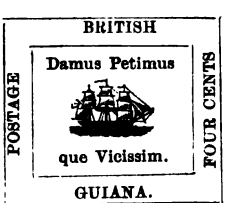


Fig. 3.

They are printed in black on coloured paper in a plain, oblong, lettered frame, name British Guiana, and full value. They are sometimes found initialed by the postmaster.

9. Four cents magenta, (*surface* coloured)
10. Four „ deep blue „
11. Four „ yellow „
12. Four „ indigo paper.

These were only in use for a short time and are almost as rare as the 1850 circulars; the 4 cents yellow are quite as much, if not more so.

Last of the issues which I now chronicle, we come to the provisionals of 1862 (*fig* 4.)

Fig. 4.

These stamps have type-set borders, with name and full value round a lineal central square, containing the post-master's initials in black, red or white ink. They are printed in black on coloured paper and rouletted. These make-shifts are known to exist with six varieties of border, viz. :—pearl boarder, crossed ovals, grapes, quatre-foil, fleurs-de-lis, and a fancy pattern. Some of them bear the words Guiana and British misspelt Cuiana and Briiish.

Now, however much some people may laugh at stamp collecting, they cannot get over the important fact that some of these ugly smudged pieces of paper possess a considerable market value. Previous to 1876, only two complete sets of the above mentioned stamps were known to exist, one in the magnificent collection of Baron ROTHSCHILD, (Paris) the other in the collection of Mons. J. B. MOENS of Brussels. The market value of each set was £150! The 1850 yellow and pink, and the 1856 yellow stamps were then considered quite unattainable, and this certainly still holds good as regards the 1850 pink, if not in regard to all. The others were only a degree less difficult to procure, but since 1879 have fallen somewhat in value.

In that year a firm of stamp-dealers advertised in the colonial press for these stamps, offering large sums, when addressed by letter on the subject, for some particularized specimens. The result was that old boxes of papers in banks and offices both in Demerara and Berbice were

ransacked, and so great was the desire to unearth these treasures that even the archives of the public buildings in Georgetown did not escape the searchers' fingers. The consequence was that a few specimens were found (tho' none, I believe, of the 1850 pink, the existence of which, on account of their rarity, is even denied by some) and one or two successful finders found themselves well rewarded for their trouble. The value of these stamps fell somewhat, but very slightly, as the dealers were crafty, and only produced them one by one. Since then they have fallen still more in value, but can only be obtained for large sums of money ; the two or three rarer ones, indeed, not at all, except perhaps when a fine collection is broken up and sold.

Other countries have given birth to stamps almost as valuable, if not quite so, as British Guiana, notably the Confederate States of America, Mauritius, Reunion Island, &c.; and to show that I am not romancing I may mention that there exists at Nuremburg in Germany a factory for the production of forged rare postage stamps. Such counterfeits would not after inspection impose on a man who had made philately a study ; but others would inevitably be deceived. The older issues of stamps were moreover so abominably printed, being in some cases mere wood-cuts, that the forger now has a comparatively easy task in imitating them.

All old valuable adhesives are much prized if they have been preserved intact on the envelope they originally franked.

In Germany, philately is encouraged in schools, as tending to teach geography and history, which it un-

questionably does, though some parents may object to the bartering and exchanging it gives rise to amongst their children. This pastime, study, science—call it what you may—is no idle pursuit or sudden craze, and is as universal in Europe among the grown-up as with the young.

I have purposely omitted saying anything about the other issues of British Guiana postage stamps, as in a pecuniary sense they are of little value compared with the above, although very interesting from a philatelical point of view; and I have only to add a table of the present market value of the stamps I have named, coupled with the hope that some of these treasures, which must still exist in British Guiana, mouldering out of sight in banks, offices, amongst old papers, and in all sorts of similar places, may again be brought to light.

	Value.			Value.	
No. 1.	Twenty-five pounds	(Stg.)	No. 7.	Three pounds	(Stg.)
2.	Thirty pounds	„	8.	Three pounds	„
3.	Fifteen pounds	„	9.	Six pounds	„
4.	Ten pounds	„	10.	Four pounds	„
5.	Seven pounds	„	11.	Twenty pounds	„
6.	Five pounds	„	12.	Eight	„

1862, provisionals (9 specimens) £2 to £3 each.

Notes on West Indian Stone-Implements, (Illustrated.)

By the Editor.

No. 1.

IT is almost certain that, at an earlier or later period, stone-implements were made and used by men in all parts of the world. Sometimes, as was the case in civilized Europe, the practice was discontinued so long ago that the very fact that stone-implements were used had completely died out from memory, and has only recently been re-discovered; sometimes, as in many parts of Australasia, stone-implements are still made and used in daily life. Sometimes, again, as in the West Indies, to give an instance intermediate between the two extreme cases already quoted, the practice has died out as completely as in Europe, but this has happened comparatively very recently. Stone-implements were probably still in common use in the West Indies and in Guiana, (which it may be stated, once for all, will be treated in these notes as part of the West Indies), three centuries ago; and many of the stones themselves still exist to this day, scattered here and there, in more or less abundance, to be recognised, when they are occasionally unearthed, as "thunder-bolts" by West Indian old women of both sexes. It is of these stone-implements that we propose to write.

The study of European and, to a less extent, of extra-European stone-implements, has progressed marvellously

during the last quarter of a century. Twenty years ago very little attention had been paid to these implements; and very little was known about them. Now, many have been carefully collected and compared; and the result has been that much light has been thrown on the forgotten, because non-historic, age during which they were used. Again, more recently, much has been done in the way of collecting comparatively modern stone-implements, especially of the American continent; and, not without considerable result, many attempts have been made to read from these their history. As an example of splendid work done in this gathering of materials for the history of the pre-historic periods of America may be mentioned the Smithsonian collection at Philadelphia and in England, the Blackmore Museum (which also consists essentially of American examples) at Salisbury. The great value of these and similar collections lies in the fact that in them are brought together such large numbers of disused stone-implements that, these being compared, the one with the other, and all with examples of the modern stone-implements still used by many savages, their original use is gradually discerned, and they are thus made to tell something of the history of the habits of the forgotten people by whom they were made and used. They form, in short, one, often the only, means by which the history of times and of people of whom no written, and perhaps at best only fragmentary traditional, record exists may be re-constructed.

As an illustration specially referring to the case of the West Indies, I may refer to the hints which I have already given in a paper read before the English An-

thropological Institute* as to the way in which the stone-implements which occur respectively in the West Indies and in Guiana may be made to throw light on the much vexed question of how and when the Caribs passed into Guiana; and I have little doubt that further knowledge of such examples would throw much further light on the whole very interesting and now obscure subject of the migrations of the various Indian tribes within the West Indies and Guiana.

But no large number of the stone-implements which occur in every island and in every district of the West Indies has ever been brought together in the requisite way. There are, it is true, a few West Indian stone-implements in the Blackmore Museum, (these having for the most part been collected, not in Guiana, but by our own Guianese explorer Sir ROBERT SCHOMBURGK); and there are a few others in most large collections of such stones. There also exist in private hands in the West Indies many more or less extensive collections of these objects. But the fact remains that no steps have ever been taken to bring any large or adequate number of these West Indian implements together, to allow of comparison, by which means alone they may be made to reveal their history.

As it would now be certainly impossible for any individual, and a long and difficult task even for any institution, permanently to collect all, or even any very large number of these implements from their various owners, we propose, as the only available alternative, to publish

* Journal of the Anthropological Institute, vol. XI, p. 360, London 1882.

a series of figures and notes, as extensive as it can be made, of West Indian stone-implements.

As it is intended to continue this series as long and as often as opportunity is offered by the acquisition of new materials, it is deemed best to publish the examples only, so far as may be convenient, in the order of their acquisition. For example, in this present number of *Timehri* will be found plates illustrating examples of stone-implements all from St. Vincent. With each set of illustrations will be published such short notes as may serve to explain the figures; and when at last it is impossible, in the absence of further specimens, to continue the series, it is intended that the whole shall be completed by a general paper in which will be gathered all such inferences as may fairly be drawn from the series, together with a classified catalogue of the whole.

Whether this undertaking will succeed or fail must depend greatly on the willingness of those who possess more or less of the desired objects to lend them for inclusion in this series.*

I have already been somewhat generously helped by several collections. Examples, sometimes numerous, from Jamaica, St. Vincent, St. Lucia, Tobago, and from Guiana, have already been put into my hands by various owners, toward all of whom I take this opportunity of recording my gratitude.

The examples figured in the present number have all been most generously supplied by Mr. E. L. ATKINSON of

* All thus lent will be carefully handled and returned to their owners, if sent to E. F. im Thurn, The Museum, Georgetown, British Guiana. Any notes or correspondence on the subject sent to the same address will also be gratefully received.

the Colonial Bank, lately stationed in St. Vincent, where the collection was formed. They are a selection from about thirty examples which Mr. ATKINSON retained as illustrating all the forms he had been able to procure in the island. The same collector has been good enough to promise to send also some thirty examples which he had rejected from his collection, as being duplicates of the simpler and more common forms among those which he had retained. Of this second set I hope to figure examples in a future number of this journal. It will then I think be found that Mr. ATKINSON'S collection affords a most instructive illustration of the cause—to which, in the paper to which allusion has already been made, I had called the attention of the members of the Anthropological Institute before I had even seen, or indeed knew of the existence of, the collection now under consideration—of the fact that by far the larger proportion of well-known Carib implements are of a more elaborate and finished nature than those derived from almost any other people. The fact is, I think, that while the Caribs certainly made a few examples of unusual elaboration, they also made many more, for common and every-day purposes, of more ordinary character, but that most collectors have not unnaturally retained only the more elaborate forms, while they have rejected all but perhaps one of the really numerous examples of each of the simpler implements. The result has been the inadvertent creation of a false impression that, as a whole, the stone-implements of the West Indies (*all* of which, by the way, are too often spoken of as Carib) are of an nnusually elaborate kind; while the fact really is that

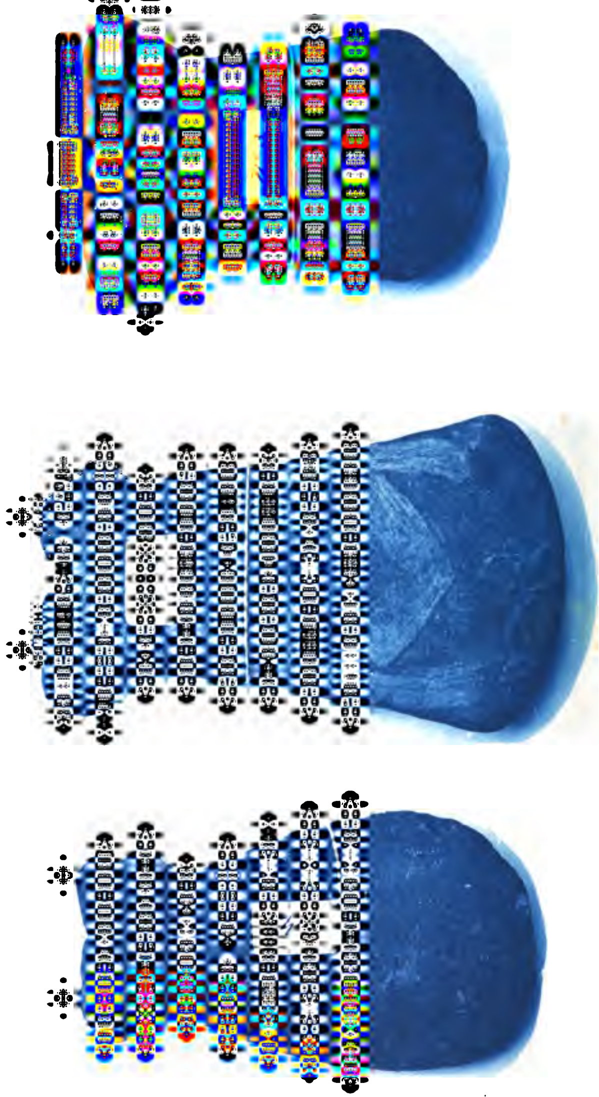
these more elaborate forms are but a selection from a much larger number of simpler forms.

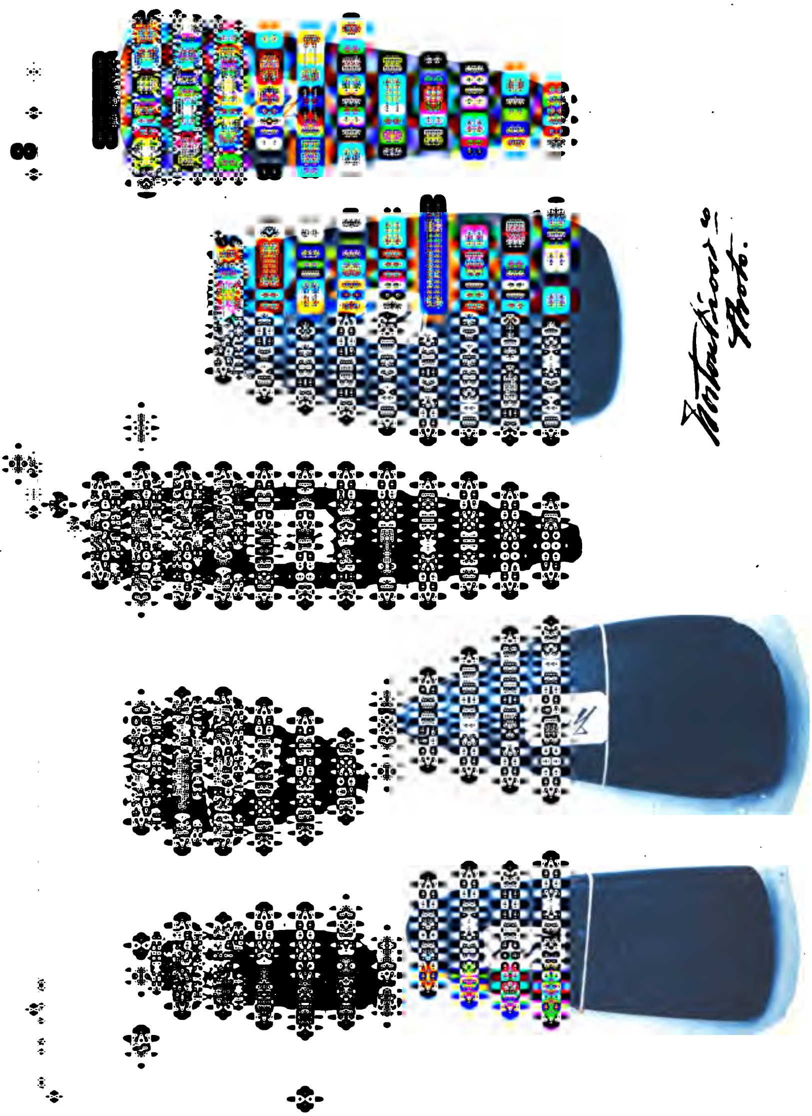
The following extract from the above mentioned paper published in the Journal of the Anthropological Institute serves to show the real difference between the simpler and the more elaborate forms. 'If, as many things seem to indicate, the habits of Indians have been the same for centuries, within each tribe, as, where not affected by European influence, they are at the present time, it is reasonable to look to modern habits for explanation of older habits now no longer in themselves evident. Now, from my own experience among the various Indians of this part of South America, I know that in their many leisure hours these people often fashion highly ornamental implements and weapons, which they never actually use, except perhaps ceremonially, but keep them proudly at home, while they take to the fields with them implements the production of which has cost less labour.' This, I think, is the explanation of the fact that West Indian stone-implements differ so much in the more or less elaborateness of their finish. Provisionally, and until this theory of the difference between the two types is displaced, it will be convenient to speak of the more elaborate, as ornamental forms, of the others, as practical forms.*

* It is perhaps as well to note, once for all, that the stone-implements of the West Indies are, as far as I know, always of that highly finished character which in the case of European implements, is called neolithic. This apparent absence from the West Indies, as from most *newer* countries, of stone-implements of the class, occurring in Europe and other *older* countries, called paleolithic is somewhat irreconcilable with the commonly accepted theory that a paleolithic period everywhere necessarily preceded a neolithic period. The difficulty does not seem fully removed by the hypothesis that the newer countries have not been sufficiently searched for discovery of paleolithic implements.

The implements now figured may be regarded as a typical series including both ornamental and practical forms. The three figured on *Plate 1*, are good illustrations of the former class, those on *Plate 2*, of the latter class.

Fig 1. Plate 1 shows an implement somewhat rudely executed, but the elaboration of the upper part of which, into the rough semblance of an animal's head, must have cost much labour, without adding in any way to the practical efficiency of the implement. It must, therefore, be regarded as one of the forms intended rather for ornament than use. *Fig. 2* is a most beautiful implement which is not only as a whole wrought to a high state of finish, but is also remarkable for the very delicately executed ornamentation of its upper part and still more—in that this is a more rare feature—for the neatly executed pattern on both of its broad surfaces. It belongs, as indeed, allowing for a certain amount of diversity, do all the three examples on this plate, to what may be called the *winged-type* of hatchet. There is good example of this type in the Blackmore Museum (A. 40. No. 7), which was collected, I believe by Sir ROBERT SCHOMBURGK, in St. Domingo. I have seen but one example of this type from Guiana. On the whole it appears to be a rare form. *Fig. 3. Plate 12* is evidently not so markedly of the winged type as the last mentioned; but it is in itself of a type fairly common, marked by the occurrence of the peculiar perforation between the wings. A splendid example of this variety, exactly corresponding in form to the one here repre-





sented, but much more highly finished, has been sent me, from St. Lucia, by my friend Mr. R. P. CROPPER.

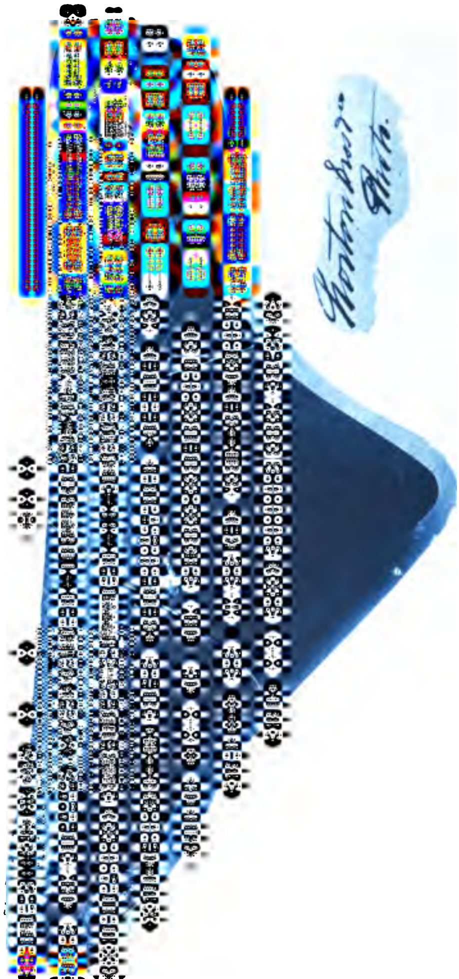
Figs. 1—6, Plate 2, are various examples of a type very common in the West Indian islands, but uncommon, as far as I know, in Guiana. It is true that stone-implements of the *shape* shown in *figs. 1, 2, 4, 5 & 6* are indeed common enough in Guiana; but those from the West Indies are easily distinguished by their very peculiarly finished *surface.* No. 3 differs, even in form, from any Guiana example known to me. On the other hand, the whole of these implements (1—6) correspond both in form and finish with many examples from Jamaica. There are specimens from the latter island in the Blackmore Museum, about which Dr. H. P. BLACKMORE, the curator, wrote to me as follows. "The similarity in form of the Jamaica stones to some from France is very curious—but is well-known. One of the specimens in the case was given me by a friend, with the history that it was found in England. I at once said no—probably Carib or French. Mr. STEVENS * then saw the specimen and said it was probably French. My friend laughed afterward, and said he had given me a wrong history purposely to see if much was known about these old stones, as he was rather sceptical on the point—and admitted that it came from Jamaica."

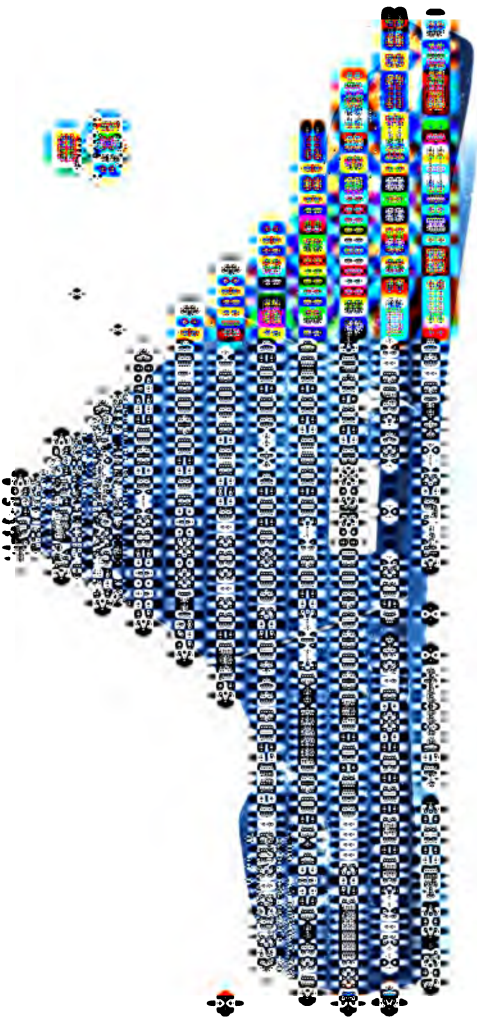
Fig. 7 Plate 2 represents a very beautiful little implement to which I know no parallel, and, though it evidently belongs to the practical class of implements, it is distinguished by the fact that it is very beautifully concave on one side, like a spoon, and in that, like certain implements of

* E. T. Stephens, the learned author of "Flint Chips."

which I shall have more to say, from Guiana, it has two small nicks, one on each side, near the top, which are probably intended to allow of its being lashed firmly to a wooden handle. It is certainly in one sense one of the most elaborate stone-implements known to me; but it is obvious that it belongs entirely to the practical, rather than the ornamental, class.

Plates 3 & 4 represent different views of a single, very large and very curious, stone-implement. At the risk of apparent levity, it must be described as like a cocked-hat in stone; and it is of corresponding size. The upper surface (when the stone is in the position shown in *Plate 3*) is concave, but the cavity is not very deep. The two ends (one of which is partly broken away) are carved to represent the heads of animals. The first and chief question suggested by this stone is, what can possibly have been its purpose? Only a very vague answer can be given to this. No other example exactly corresponding to this is known to me. But certain stone objects which resemble this in all but one important feature have been found in other parts of the West Indies. The feature in which these differ from the example here figured is that they do not end below in a point, but are provided with four legs, so that they are in fact known as 'stone-tables.' There are several examples of these *(H. 11. Nos. 5 to 7)* in the Blackmore Museum. These were brought from St. Domingo; and the writer of the museum catalogue suggests that they were used for bruising grain; that they were, in fact, mortars in which grain was pounded. The moment I saw these stone-tables I was struck by





their identity in all but material with the wooden benches which still form almost the most prominent feature in the furniture of the houses of the Indians of Guiana. Similar benches were used, as is evident from the occurrence of specimens, either entire or in a more or less broken condition, by the Indians of the West Indian Islands.* These wooden benches are almost always—indeed, as far as I know, invariably—either rough representations of animals, or the two ends (the bow and the stern, as we may call them) are carved, as in Mr. ATKINSON'S stone here figured, to represent the heads, or the head and tail, of animals. I have myself little doubt that the 'stone tables' such as those in the Blackmore Museum, the wooden benches formerly and still used by Indians, and Mr. ATKINSON'S stone-implement, are all examples, varying according to circumstances, of benches. The fact that the last mentioned example ends in a point, instead of being provided with legs, so that it can not be made to stand upright *on a hard surface*, may perhaps be explained by the circumstance that Indian houses are often built on loose sand in which the pointed base of the bench might be inserted.

It may be as well to add that in answer to a suggestion which I made to Dr. BLACKMORE that the so-called 'stone-tables, used in bruising grain' are really benches or stools, he wrote as follows: 'what you say respecting the so-called stone-tables is very interesting; if they are merely stools, what are their real corn-rubbers or mills like? or how do they bruise and prepare the corn?

* There is very good example in the Christy collection, in form of a man.

Possibly the same object may serve two uses, although not quite falling in with our civilized ideas of niceness.' My answer to this is that I know of no corn-rubbers, nor do I think that any such necessarily existed in the West Indies. The breadstuff chiefly used here is cassava, which is prepared by grating, drying and sifting, without the use of any mill or mortar. If corn (maize) was originally used in these parts, if that is to say, it was not introduced by, or after the coming of, Europeans, some form of mill must almost certainly have been in use, for corn cannot readily be prepared by any such process as is used for cassava; but I have not as yet been able to discover any convincing evidence of the *native* use of corn.

Coffee Cultivation in Berbice, 50 years ago.

By Alexander Winter.

ALTHOUGH there is no coffee-estate now in Berbice, and has not been for many years past, yet coffee cultivation was at one time a very important industry here, even more so than sugar. At the time of the junction of the colony of Berbice with those of Demerary and Essequibo, forming the united colony of British Guiana, which was in 1831, there were in full operation in Berbice 31 sugar-estates, 40 coffee-estates, and 8 cotton-estates. Of the 40 coffee-estates, 17 were situated on the right bank of the Berbice River, 17 on the left bank, and 6 in Canje.

These were owned partly by resident proprietors, living on their own estates, such as the late WOLFART KATZ, Esquire, said to have been the most extensive *resident* proprietor in the West Indies*, partly by English merchants residing in London or Liverpool, and partly by Dutch merchants residing in Amsterdam and represented by Dutch planters living in Berbice.

The history of some of these estates is rather curious. Several of them were owned by the once well-known PAUL BENFIELD, a large capitalist, the Rothschild of his

* Mr. Katz lived in a fine mansion on his Plantation Vryheid, a coffee-estate near New Amsterdam; besides which he was sole owner of Plantations Philadelphia, Gebroeders, S'Gravinhague, Cotton Tree, and Belair or Number Six, on all of which there were large gangs of negroes. Although the compensation allowed by Government at the time of emancipation, was only 8s. in the £ on the appraised value of the property taken, Katz's share of this was over £63,500 sterling!

day, who negotiated loans for Governments, and had advanced large sums to the French Government in the time of the Bourbons. When France became a Republic after the revolution of '92, these claims were repudiated; and PAUL BENFIELD is said to have died a pauper! At the restoration of the Monarchy however, after the battle of Waterloo, BENFIELD'S claim was acknowledged and honestly paid with interest, and his family then became very wealthy. Two of the heiresses married members of the Berkeley family, who thus became connected with this colony as owners of what were called, the 'Benfield estates.' These consisted of Plantations *Edinburgh, Glasgow, Welgelegen, Herstelling, New Welgelegen, Belmont, Union, Monchoisi, Zeelught and Edderton,*—in all 6,655 acres. They were not very thriving estates, and GRANTLEY BERKELEY, one of the parties interested, used sometimes to get up in Parliament and ask the Colonial Minister how it was, "that he got such small returns from his estates in the West Indies." These estates have all now been out of cultivation for many years; and the land has been sold to villagers!

What were called the 'Dutch estates' were mostly in the possession of large mercantile houses in Amsterdam, such as Westerloo and Co., Charbon and Zoon, and Westerick and Poole, who held the titles of the estates in their own names and administered them through the agency of their attorneys in the colony. They also shipped all the stores and supplies for the estates in their own vessels, which also carried home the crops, which were kept on hand till one of the Dutch ships arrived; for the crops were

bound to be shipped to Holland, and in Dutch bottoms. These Dutch ships were very awkward clumsy looking vessels, high at the bow and stern and low in the middle. They were not very fast sailors, but very safe.

Although the merchants of Amsterdam had the entire charge of the Dutch coffee-estates in their hands, they were not really the owners; for these were owned in shares, which were transferable and could be bought and sold on the exchange, like shares in any company. This practice is reviving in the colony, several large estates in Demerara being now owned in transferable shares on the old system. This has probably been adopted in consequence of the peculiar and inconvenient Dutch law of inheritance.

These estates were conducted on a different system from the English estates. The managers received very small money salaries, but it was made up to them in other ways. For instance, their houses were furnished for them, and they were allowed a small share of the plantains, rice, salt-fish, tobacco &c. sent to the estates for the people; then, they could help themselves to the osnaburghs, salemporas, drill &c., shipped from Holland for the same purpose, and have them made up into clothing by the house servants; so that they had very little to buy, and were very comfortably off; besides which, the Dutch ships when they came in always brought the resident managers and attorneys supplies of schiedam, claret, liqueurs and other good things for the table. On all of these the merchants in Amsterdam had their commission.

All the coffee-estates were pleasant places to visit. The managers generally had a good deal of leisure time on their hands. They kept nice gardens, and had abundance of vegetables and fruit to spare; the hedges were neatly trimmed; and altogether the surroundings were very picturesque and attractive.

The cultivation of the coffee was a kind of gardening, and consisted of weeding between the coffee-bushes, and trimming the old branches so as to promote the growth of new wood, from which alone fruit was to be expected. The coffee was planted under the shade of tall trees called in Berbice Sand-Kokers, in Demerary Oronoque-trees, and botanically *Erythrina cristagalli*.

Coffee, at the best, is a very uncertain crop. It requires peculiar weather: a spell of dry weather to check the growth, followed by copious rains to bring out the blossom. If instead of this there were continual showers when the trees were "working," as it was called, the result was a development of leaf, instead of flower-buds; and there was no crop.

Were all things favourable, and there were signs of a good blossom, the news soon spread throughout the colony, and all parties connected with coffee-estates were a-stir, and eager to go and witness the "coffee-blossom." It was best seen in the early morning, before the sun was high, and you had to start at a very early hour. Some enthusiastic planters would take their hammocks and sleep aback, in order to see the blossom to advantage, and make an estimate of the probable extent of crop.

The large estates had some five or six hundred acres in coffee, divided into fields of ten acres each, separated by intervals called "alleys." These, being mostly planted with fruit trees, were called fruit-alleys. Each field had the number of trees it contained painted on a board at one corner of the field; so that, to judge the extent of the "blossom," you had to decide what was the average to be expected from each tree, and then multiply it by the number of trees, modifying it by circumstances, some fields having more young trees than others, some more "water sprouts" from neglect in pruning, some being injured from neglect in weeding. It required considerable experience and practice to make a correct estimate. If the blossom was a fine one, you might see people driving into town in triumph, waving branches of coffee trees, white with the jasmine-like flowers.

But there was still uncertainty; the blossom did not always "set" as it was termed, or form fruit; or from some cause, the young fruit would drop, and there would be great disappointment.

If all went well, and the crop began to ripen, the busy time of the coffee-estates commenced. All hands were sent aback to pick coffee, and everybody that could be mustered was employed in getting in the harvest before it fell from the trees. Horses were turned out to graze, that the grooms might pick coffee instead of cutting grass; managers and attorneys had to diminish the number of their attendants as much as possible, and every effort was made to secure the crop, the reward of all their toil.

There was much competition among the neighbouring estates, as to which should make the largest crop. As soon as 100,000 lbs was gathered in, a flag was hoisted at the top of the logie, and great were the efforts to be the first to "hoist the flag". The people, too, shared the excitement, and it was a cheerful sight, of an afternoon, to witness the return of the pickers from aback; bateau after bateau would be seen racing home in the canal, each loaded with baskets full of fresh picked coffee, which looked like red gooseberries.

On reaching the buildings, the coffee was carried up into the loft over the pulping-mill. Here it was measured. The coffee, as it was brought in, was poured into a square box which held as much green coffee as would yield 14 lbs. of clean coffee when divested of its pulp. A tally of the number of boxes was kept by an overseer, and each person bringing in a boxful received a ticket.

From this upper floor the coffee was sent down a spout or shoot to the mill, where it was divested of its outer husk or pulp, which fell in one place, while the beans fell in another. The pulp was carried away and thrown in a heap, where it soon fermented, and became most offensive to the neighbourhood, far worse than the "lees nuisance". The beans, divested of the pulp, fell into a brick gutter, sloping down to the wash-pit. This was a square brick cistern, about 5 feet deep, into which water flowed in at one end and out at the other. Here the coffee was washed, being hauled backward and forwards by a kind of wooden rake. This washing cleaned the beans from the slimy juice adhering to them, and they were then taken out and spread over the "droogherie", a raised

and tiled pavement sometimes called the "barbacot" or "plankier," where they were dried in the sun, and were then carried up to the logie, to be stored till the picking of the crop was finished. There were generally two crops in a year.

If the crop was large, great care had to be taken that the coffee in the logie did not get heated, and thus spoilt. To prevent this, it was spread as thinly as possible and constantly turned by wooden shovels day and night. Large as the coffee-logies were—many of them over 100 feet long—when the coffee was plentiful, there was danger of its getting heated, and extra buildings had to be used to house some of the crop. Occasionally managers and attorneys had to submit to having some of their rooms used for this purpose.

When the picking was over, the crop had to be prepared for shipment, which was a somewhat tedious process, requiring a good deal of care and attention. It had first to be husked and deprived of the "parchment skin" which surrounded each bean. For this purpose it was first spread out on the droogherie and dried in the sun till it become quite hot and the outer skin crisp and brittle. It was then taken to the "stamping-mill" and thrown into a circular trough about 3 feet deep and a foot wide, and subjected to the pressure of two heavy wooden rollers, a foot wide, six feet in diameter, which were kept revolving by mules. This process broke the crisp outer skin, which was blown away by the winnowing machine like chaff, leaving the coffee quite clean and fit for use. It had however to undergo further manipulation,

as the different qualities had to be sorted and shipped separately. This took a good deal of time, as every single bean had to be separated by hand. This was done by women, who sat down on the floor of the logie in long lines, each having her allotted task before her in a sieve. The coffee was carefully hand-picked, the good beans being put into one calabash, those broken into another, and the inferior, discoloured beans (the effect of "heating") into a third calabash, to be thrown away.

The "broken coffee" was as good as the "whole" in quality, but inferior in appearance, and was called "triage" by the London brokers, and sold at a lower price. There was always a proportion of pearl-coffee in every crop, and this was considered the best of all. When a berry instead of having two beans, had only one, it took a rounded form instead of being flat on one side, as usual; this was the so-called pearl-coffee. If the proportion of pearl-coffee was considerable, it was separated from the rest and shipped by itself. It sold high in the London market, fetching 120/ per cwt. when other coffee sold for 80/ or 85/. But the quantity of pearl-coffee shipped was not great.

The coffee when cleaned and prepared for shipment was put away in a large air-tight compartment, called the coffee-chest, which was of sufficient dimensions to hold the whole crop; for this had to be kept on hand until the ship that was to take it arrived. These coffee-chests were built of dark wood and were kept carefully polished; for the planters were very proud of them. They were made perfectly air-tight,

not only at the sides but at the top also. When the coffee was wanted for shipment it was taken out of the chest and put into tierces or bags.

Coffee was more or less injured on the passage home, by the steam from the sugar on board, and it was desirable to ship it, if possible, in a vessel loaded entirely with coffee, or at least, having no sugar on board. A small vessel came here once from Jersey loaded entirely with potatoes in bulk; these were readily disposed of, and the ship loaded home with coffee.

The freight of coffee was higher than sugar, it being lighter; when the freight of sugar was 3/ per cwt., coffee paid 4/.

Berbice coffee ranked high in the market, and was bought to mix with Jamaica coffee, which being grown on the mountains, was more delicate in flavour than that from Berbice but not nearly so strong.

That particular quality is still called "Berbice coffee" in the shops in London, though none has been shipped from Berbice for twenty or thirty years.

The cessation of the coffee cultivation has been a great social loss to Berbice, as reducing the number of the educated class. Each estate had not only a manager, but by law was obliged to have a white overseer for every hundred negroes. But it was impossible to continue the cultivation under the free system without loss. This the Dutchmen very soon discovered, and they sold their estates and cleared out to a man. The free system did not suit their ideas at all, any more than it does that of their countrymen, the Boers, in South Africa.

There were several reasons for this, but the principal one was, that the negroes, when entirely free, would not pick the crop. At first they would do a little. For instance a woman would go aback and bring in a basket of coffee about 12 o'clock, for which she got a guilder. When urged to go and pick a second or third basket, which could easily be done, and was done under the coercive system, the answer was "No, I am not inclined to work any more to-day, I have earned my guilder and am satisfied." The consequence was that half the crop fell from the trees and was lost; for, when once ripe, the berry does not remain long on the trees. When the negroes bought land, and lived in their own houses, the coffee-estates got none of their labour, for it all went to the sugar-estates, where they preferred going, when disposed to work for money wages. They showed a marked preference for working on the sugar-estates. This really was the cause of coffee cultivation being abandoned. It was not so much a question of price, but simply the want of labour. The only supply of labour in the country was that of the emancipated negroes; and that was withheld. Besides which the estates lost their market for plantains. Formerly the coffee-estates not only fed their own gangs with their plantains, but had contracts with the sugar-estates to supply them; and so they were sure of a sale for their plantains. After freedom this market was lost, and there was nothing to meet the current expenses of coffee cultivation; and very soon the negroes themselves became growers of plantains. So there was nothing for it but to give up and go! The buildings were sold

off as old materials, the land was either disposed of, in lots to villagers, or taken over by some neighbouring sugar-estate. And thus coffee cultivation in Berbice, once such a thriving industry, became a tradition of the past !

On British Guiana Cane Soils and Artificial Manures.

By Ernest E. H. Francis.

AT the present time little or no definite knowledge is obtainable respecting the most suitable artificial manure for promoting the growth of the sugar-cane in this colony. The difficulty of selecting a special chemical fertilizer adapted to any particular soil is easily and systematically evaded by using manures of a highly complex nature, such as guano, or fish, or blood, manure, or fancy priced mixtures compounded of ingredients known only to the makers. Like that wonderful panacea, the mithridate of old, made from some sixty or so of the most incongruous ingredients, it is odd indeed if the right one is not amongst them. But simplicity now reigns in medicine; and the practice prevails of using some one substance—the one required—or as few as may be, in place of the sixty taken haphazard. So it should be with manuring. The problem to be solved with regard to the right application of chemical manures is contained within a tolerably narrow and definite compass; and when the magnitude of the interests centred in cane cultivation is considered, it affords matter for wonder that greater advancement has not been made towards its solution. The principal object of manuring is to supply those mineral matters essential to plant-growth that a soil lacks or is deficient in, and further to restore such as are removed by each successive crop;

and the key to the problem rests chiefly in the hands of the chemist, who alone is able to point out the nature of the ingredients concerned.

M. VILLE, the principal advocate for the use of artificial manures in place of natural ones, classifies cultivated plants into three divisions, or those in which nitrogen, phosphoric acid, and potash, respectively, should be the dominant constituent in the manure applied to them. He places sugar-cane in the second class, as chiefly requiring phosphoric acid, and gives instances of excellent crops resulting from the application of his normal cane manure, consisting of calcium super-phoshate, calcium sulphate and potassium nitrate, to almost barren soil in one of the French West Indian islands. He states that on the soil of an estate in Guadeloupe which hardly yielded one ton and a half of cane per acre without manure, there were raised twenty-three tons per acre by the use of the mixture above mentioned. And in another instance 33 tons 18 cwt. were obtained with the aid of his chemical manure from soil that only yielded 24 tons 18 cwt. with farmyard manure and 10 tons 12 cwt. when no manure at all was applied.

That ammoniacal salts and highly nitrogenous manures are of minor importance in cane culture is unquestionable. Such manures are valuable for growing leaves, seeds and fruits, but not for growing sugar. Cane of course requires a certain amount of nitrogen; but the ammonia and nitric acid washed out from the air by rain should be sufficient to supply a large proportion of its needs. In fact, M. VILLE found in the experiments at Guadeloupe just referred to above, that by dis-

pensing with the nitrogen in the manure employed, it still sufficed to yield twenty-two tons eight hundredweights of cane to the acre.*

Even if nitrogenous manures could not be dispensed with altogether, it would be a great point gained to reduce their use to a minimum. Not only is nitrogen paid for at an immensely higher rate than any other manurial substance, but the supply of matter containing it is limited, and likely to decrease unless new and unexpected sources are discovered. The exhaustion of the guano deposits is only a question of time, and should coal gas be superseded by the electric light the most important source of our ammoniacal salts will depart with it.

According to the analysis of PAYEN, ripe sugar-cane (Otaheite) has the following centesimal composition :—

Water	71·04
Sugar	18·00
Woody matter	9·56
Albumen and nitrogenous matter †	0·55
Wax, fat, resin and colouring matter	0·37
Mineral matters or salts	0·48
	100·00

Of the above substances only the mineral matters and perhaps a portion of the nitrogen are supplied by the soil; so, apart from its physical condition, the difference be-

* He also found by employing no lime in his manure (the other ingredients remaining the same) that only twenty tons of cane were obtained per acre, while without potash only fourteen tons, and without phosphates only six tons, of canes were produced. His instructive experiment thus bears out his statement respecting the importance of phosphoric acid as a cane fertilizer.

† Containing about 0·1 per cent. of nitrogen.

tween a good and a bad cane soil principally depends on its power of readily supplying the cane with less than a half of one per cent. of mineral substances. Leaving out of the question nitrogen, which, like carbon dioxide and water, may be regarded as more or less an aerial plant-food, let us confine ourselves to the strictly mineral substances that the cane assimilates from the soil. By burning a known quantity of cane, and weighing the ash obtained, the gross amount of mineral matter is determined; and by submitting this ash to a quantitative analysis the nature and proportion of its constituents is readily ascertained. The following table shows the mean percentage composition of the ash, calculated from the analyses by Dr. STENHOUSE, of twelve samples of sugar-cane from Trinidad, British Guiana, Grenada and Jamaica (1), and also of the ash of a ripe cane with its leaves, given by Dr. PHIPSON (2).

	I.	II.
Potassa	19·70	18·00
Soda	3·36	2·00
Lime	8·71	10·00
Magnesia	7·62	6·50
Sulphuric acid	6·62	8·00
Phosphoric acid	6·81	6·00
Chlorine	5·62	4·50
Silicic acid..	43·15	43·00
Oxide of iron maganese &c...	–	2·00
	101·59	100·00
Deduct oxygen... ...	1·26	
	100·33	

Presuming then that the cane yields 0·48 per cent. of mineral matter of the above composition, it follows that a crop of say 30 tons to the acre would remove from that extent of soil 344·56 pounds, or nearly three hundred

weight of mineral matter, which, according to PHIPSON'S analysis, would consist of :—

58·06	pounds	of	Potassa
6·45	"	"	Soda
32·26	"	"	Lime
20·97	"	"	Magnesia
25·80	"	"	Sulphuric acid
19·35	"	"	Phosphoric "
14·52	"	"	Chlorine
138·70	"	"	Silicic acid or 'silica'
6·45	"	"	Iron and manganese.
322·56			

Silica, it will be seen, is assimilated by the cane in larger quantity than any of the other substances; but, fortunately it exists in enormous quantities in all soils, and no fears need be entertained of its ever becoming exhausted. The other substances, however, needed for the growth of the cane with the exception of iron, are usually present only in comparatively minute quantities, some of the most important ones being often met with only in 'traces', or are even altogether absent. Thus, in the *Report on Soils from British Guiana* communicated to the Royal Agricultural and Commercial Society by the Hon. WILLIAM RUSSELL in 1880, we find analyses of 134 samples of soil from various estates, made by Mr. THOMAS JAMIESON of Aberdeen ; and of that number a large proportion contained *none at all, or only traces of lime, sulphuric acid, phosphoric acid and chlorine*, as the following summary will show :—

Name of constituent.	Number of samples containing none.	Number of samples containing only traces.	Per cent. of samples deficient in plant-food.
Lime	26	62	66
Phosphoric acid...	44	57	74
Sulphuric acid ...	14	59	54
Chlorine	17	46*	47

* Mr. Jamieson returned these 46 samples as containing a "moderate" quantity of chlorine, but as he holds that a "trace" of that element is sufficient in a cane soil see page 22 of the Report) it was thought proper to include them here.

In order to show the average composition as well as the variation met with in the soils employed for growing canes in British Guiana the following table has been compiled from numerous analyses (about 150) made by Dr. ALFRED SIBSON, Dr. NEWLANDS, Dr. PHIPSON, Mr. SCARD, Mr. JAMIESON and myself, of soils from estates in all parts of the colony.

Percentage composition of British Guiana Cane Soils, exclusive of Water and Organic Matter.

CONSTITUENT.	SURFACE SOIL.			SUB-SOIL.		
	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.
Potassa	0·21	0·57	0·02	0·19	0·56	0·02
Soda	0·20	0·98	0·01	0·27	2·22	0·01
Lime	0·20	0·99	0·10	0·22	0·62	0·08
Magnesia ...	0·50	1·44	0·11	0·53	1·41	0·08
Ferric Oxide ...	4·51	11·07	1·78	5·10	10·68	2·22
Alumina	8·98	15·35	3·66	8·90	12·95	2·36
Sulphuric Acid ...	0·08	0·31	Trace	0·07	0·50	Trace
Chlorine	0·03	0·08	None	0·03	0·09	0·01
Phosphoric Acid..	0·09	0·24	0·02	0·08	0·18	0·02
Silicious Matter..	73·58	83·25	59·60	78·04	82·58	70·88
Nitrogen... ...	0·25	0·85	0·05	0·16	0·41	0.05

It will be noticed that with the exception of silicious matter and iron, the mineral substances required for the growth of the cane exist only in the proportion of a fraction of a per cent. Nevertheless,

the actual amount in any given extent of the average soil is sufficient to supply the wants of even a large number of successive crops. The weight of any constituent in a specified area of soil can easily be ascertained from the analytical figures, by remembering that a tenth of one per cent. represents about two tons (4480 lbs.) to the acre, of soil 12 inches deep. As we already know the nature and quantity of the mineral matters removed by an acre crop of 30 tons, we can also easily calculate the number of such crops that a soil would sustain before complete exhaustion ensued. Thus taking the "mean" figures given in the above table to represent an average cane soil we should find that—

An acre 12 inches deep contained of :—		Or a sufficient quantity for :—
Potassa	9408 pounds	162 crops
Soda	8960 „	1389 „
Lime	8960 „	277 „
Magnesia	22400 „	1068 „
Sulphuric acid	3584 „	138 „
Chlorine	1344 „	92 „
Phosphoric acid	4032 „	208 „

Of course it is not to be understood that any soil would continue to support crops until it became quite exhausted; although, on the other hand, it would be impossible to say at what point it would become sterile. To insure that the soil is kept permanently in proper condition, no exhaustion whatever of its constituents should be permitted. Any loss that it sustains on account of the crop should at once be made good by means of the properly selected manures. If sufficient manure can be added to cause a gradual increase in its fertilising constituents, so much the better. The figures given above have therefore only a relative value, yet serve to

show more plainly than a mere analysis can do what constituents would soonest need renewal. For example, comparing the potassa with the soda, we find that although both are present in nearly equal quantity in the average soil, the potassa would be removed more than eight times as fast as the soda. It will also be evident that the chlorine, the potassa, the sulphuric acid, the phosphoric acid and the lime are the substances towards which attention should be chiefly directed.

Authorities on agricultural chemistry usually consider that the potassa, the phosphoric acid and the lime are the principal constituents of soils that stand in need of renewal, alleging that chlorine and sulphuric acid are present in sufficient quantity as a general rule. I have shown however, that a large proportion of British Guiana soils are deficient in both the latter substances, while from the analysis of cane ash it will be seen that each of them forms an important part of it—sulphuric acid, indeed, being present in the ash in greater quantity even than phosphoric acid. Therefore, it is evident that the average cane soil of the colony requires not only lime, phosphoric acid, and probably potassa, but also a due proportion of chlorine and sulphuric acid.

Chlorine can be supplied most cheaply in the form of common salt (sodium chloride); or if the soil is deficient in potassa, potassium chloride may be used, but it is much more expensive. It is usually considered that the application of common salt as manure is unadvisable, owing to the possibility of its reappearing in the juice, to exercise its reputed prejudicial effect on the crystallisation of the sugar. I am of opinion, however, that no

ill effects of the kind would follow its use, provided no great quantity were employed. At all events the matter is well worth the test of experiment; and trials might be made on a small scale, by applying the salt in the proportion of from two to three hundred-weights per acre to soils known to be deficient in chlorine.

Sulphuric acid is contained in sulphate of ammonia and in superphosphate of lime; and doubtless when those substances are used as manures, the sulphuric acid often shares in producing the beneficial effects usually attributed to the ammonia and phosphoric acid. It is even probable that the ascertained superiority of superphosphate over insoluble phosphate depends more upon the existence of sulphuric acid in the former compound than upon its mere solubility; especially as there is reason to believe that *superphosphate* is speedily converted into insoluble, and almost inert, phosphate of iron and alumina when mixed with the clay soils of this colony.

One of the cheapest manurial substances containing sulphuric acid is selenite or gypsum, a hydrated sulphate of lime which is found native in immense quantities and consists of :—

Sulphuric Acid	46·51
Lime	32·56
Water	20·93
	100·00

In fine powder and in a partially dehydrated state it can be bought in England for fifteen or sixteen shillings a ton. It serves to supply lime as well as sulphuric acid, and might in many cases advantageously replace a portion of the slacked lime so extensively employed in cane

lands. Not only does it contain the necessary elements of plant food, but it augments the fertility of clay soils by facilitating the solution of the alkaline silicates of which they partly consist. Gypsum dissolves in 400–500 parts of water ; and A. COSSA has shown by a series of experiments that water containing gypsum dissolves from two to three times as much mineral salts out of the rocks of which clay is formed as pure water does. The presence of gypsum in soil is also of benefit from its power of absorbing and fixing atmospheric ammonia. In soils deficient in sulphuric acid the addition of gypsum in the proportion of from one to two tons per acre is well worth a trial. The substance is cheap, it can do no harm, and may be productive of immense benefit. I strongly recommend an extensive trial to be made of its merits.*

The only remaining substance that it is necessary to notice is phosphoric acid. This is usually applied in one or other of the various forms of phosphate of lime; and experiments are much wanted to decide whether insoluble phosphate in a finely divided condition is equally efficacious as a cane fertilizer with that rendered soluble by sulphuric acid, and known as "soluble" phosphate or super-phosphate of lime. Insoluble phosphate

* Since writing the above I have had sent to me an extract from a letter giving the results of trial with gypsum in a cane-field, made by the Hon. W. Russell at my suggestion. The extract is as follows:— "The field No. 20 P. W. to which the gypsum was applied has improved wonderfully, and is now about 20 per cent. better than the adjoining field No. 19, which was cut and planted at the same time, and at the start off was the better of the two. I further noticed at the small drain heads, where the indications of iron were most noticeable and where the canes appeared stunted and dry, that a marked improvement has taken place".

can be bought at a much cheaper rate than soluble phosphate, but has hitherto been considered to be of little value as manure; recent experiments, however, that have been carried out by Mr. JAMIESON in Aberdeenshire and elsewhere, tend to show that this conclusion has been arrived at too hastily. When properly prepared ordinary phosphate of lime was tried against soluble phosphate on root crops, hardly any difference in the results was obtained. Indeed, Mr. JAMIESON claims with full confidence to have determined the effect of insoluble phosphate, in more finely divided form than simple grinding accomplishes (*i. e.* steamed bone-flour and precipitated phosphate), as equivalent, or superior, to the effect of soluble phosphate. Even mineral phosphate, which is usually regarded as valueless until treated with sulphuric acid, has been found to exert an effect but little inferior to super-phosphate, when it has been reduced to an impalpable powder by mechanical means. From its insoluble nature, however, mineral phosphate is somewhat backward in its action; but by mixing it with animal phosphate, in the form of steamed bone-flour, results were obtained equal to those given by soluble phosphate, at but little more than half the cost.

Occasional Notes.

The Schomburgk Brothers.—To us, the people of the place, British Guiana appears of considerable importance; but it is to be feared that to all but us and our friends it is a very undiscovered country. Even those whose geographical knowledge is so vast that they know that Guiana virtually forms part of the West Indies, are apt to think of the place as an island; and it is not so very long since it was spoken of as an island in a very high place indeed. Another mistake often made is a confusion of Guiana with Guinea; and it is hardly possible to read through any one of the extensive, and often learned, catalogues of the topographical works on sale by German and French booksellers without seeing instances in which Guiana books have been entered under the head of 'Africa', Guinea books under 'Americana'. Moreover, there lies before me at this moment an envelope officially addressed, in this present year, from the Cambridge University Library to *'Demerara U. S. A'!* Let us, however, be thankful for that, little as it is, which people in general do know of us, and let us be especially thankful to those who spread this knowledge. Among these latter none has done more for us than have the brothers Schomburgk: Sir ROBERT SCHOMBURGK by his reports on Guiana published in the Journal of the Royal Geographical Society and by his other writings, Dr. RICHARD SCHOMBURGK by his "Reisen in Britisch Guiana". Of these two travellers Sir ROBERT came to Guiana as long ago as 1835, and was here, with

one interval, till 1843; while he was joined and accompanied by his brother RICHARD from 1840. Sir ROBERT died in 1865; Dr. SCHOMBURGK still lives in Australia, and does excellent work as the widely known and much respected Director of the Botanic Gardens at Adelaide. But for about forty years the Schomburgks, though their names will for ever be associated with British Guiana, have had no actual connection with the place. Quite recently, however, the surviving brother has addressed a long and interesting letter, full of biographical details, to one still among us, who at the time the brothers were in Guiana was in the circle of their most intimate friends. This letter we have kindly been allowed to publish; and we most gladly avail ourselves of the opportunity thus afforded of making known something of the later life of, at least, one of the heroes of Guiana. The letter is as follows :—

Botanic Gardens, Adelaide,
19th November, 1881.

MY DEAR MRS. MANGET,

Your kind letter reached me on my 70th birthday and I assure you I deemed it the most valuable birthday present I received. It called to my mind the happy days I spent in your dear aunt's house and in Zeelandia. A few weeks before the arrival of your letter, I received a visit from Mrs. and Mr. Tinne, Georgetown, on their route to England, having first visited Mr. Tinne's brother, who is settled in New Zealand. You can imagine how eagerly I inquired after you and my friends; of the latter I was informed very few were left.

Now let me give you a condensed biographical sketch since I left Georgetown. After seeing my lady-love, relations and friends, I settled in Berlin for the purpose of publishing my travels in British Guiana, The late King Frederick William IV permitted me to dedicate the work to him; it appeared in 1847 in three volumes. The work was well received by the savants and the German press.

In my work I could not forbear to mention the happy hours I spent in Zeelandia, and to speak of the so amiable and pretty Miss Ross.

In the eventful year 1848 in which the people tried to obtain that what he King had promised them, viz: a constitution, they became clamorous, and the Revolution broke out in Berlin. You can think that my late brother Otto, with whom I was living, and I aided the people's cause. Although the people were victorious, alas! the dream of liberty was only of a short duration, the reaction gained in ground again and the leaders of the people's cause became marked men. As the Schomburgk brothers belonged also to the black sheep, our protector Baron Humboldt advised us to emigrate. A number of friends of the same mind resolved to emigrate, and selected South Australia as our new home; we chartered a vessel in Hamburg and left the dear father-land in March 1849. The wedding with my lady-love took place four weeks before our departure.

South Australia was reached, full of hopes for the future. We bought land for the purpose of farming and vine growing, and christened our settlement "Buchsfelde" in honor of the late Baron Buch, the celebrated geologist, our benefactor. A good many Germans settled in our neighbourhood.

Sixteen years were spent in "Buchsfelde", under labour, toil and anxiety, which new settlers have always to undergo. My good wife although not used to such a rough life, braved it nobly. Six children were born, five girls and one boy, named Marie, Jeny, Clara, Anna, Rosy and Otto.

The first loss in our happy family was my brother Otto, leaving a wife and one son.

The management of our farm depended now on me; a few months later the news reached us of the death of poor Sir Robert in Berlin.

In 1865, the Directorship of our young Botanic Garden in Adelaide was offered to me, which I gladly accepted for many reasons; the principal one was that I could give my children a better education in Adelaide than they could receive in the country. I sold the property and settled in Adelaide.

A new era began in our life! I soon gained the people's favour, and hitting their taste, I became their pet; our life was rendered a happy one, until fate, jealous of our happiness, changed it into sadness. We had to deplore the loss of our second daughter, Jeny, in her 19th year,

from typhoid fever; nature had gifted her in every regard, especially with the talent of painting. Scarcely had the wound been healed, when a more severe blow befell us; it pleased God to take my dear beloved wife from us! She died from heart disease in her 57th year, after 32 years happy marriage! Her place in my heart can never be filled, the wound that her death caused will never heal! She was a tender, loving, faithful, and indulgent wife.

My eldest daughter Marie keeps house. My third daughter Clara is married to Dr. Phillips, living in Sydney now. He has a large practice. She has made a very good party. Anna the fourth daughter is staying at present with her. My son Otto has an appointment in the Government service and is at the same time Lieutenant in the local artillery. Although a septuagenarian, I am still hale, and healthy (with the exception of attacks of gout), no white hair has made its appearance yet, and people consider my age between 50 and 60 years.

Like Sir Robert, orders and distinctions have been conferred on me from a number of crowned heads and scientific European and American bodies; and the names of Robert and Richard Schomburgk will not soon be forgotten.

I am sure you have had enough of my letter all about myself and my family and so will close the biographical sketch of the Schomburgks.

I hope your letter will not be the last one. I have sent by this mail in a separate letter, the photographs of the family. With kindest remembrances and very good wishes to you and Dr. Manget.

Believe me,

Dear Mrs. Manget,

Very faithfully yours,

R. SCHOMBURGK.

The Cannon-ball Tree (Couroupita guianensis). The following extract is from the "Gardener's Chronicle" of August the 5th 1882:—

Mr. Jenman, the colonial botanist of British Guiana, sends us a photograph of the flowering and fruiting stem of a young cannon-ball tree, taken in the Promenade Gardens, Georgetown, British Guiana, which we have had engraved. This particular tree, which, as will be seen, is well named, is about 45 or 50 feet high, with a stem 18 inches

thick, free of branches, as shown, and with a handsome spreading, hive-shaped head of dense dark green foliage. This is a young tree. In its native forests it grows to a much greater size. Couroupita guianensis inhabits the wide-stretching alluvial land skirting the rivers of British Guiana, where it is plentiful, attaining a height of 80 to 100 feet or more. It is of fine growth, and quickly forms a fine feature as a specimen plant in a tropical garden. It suddenly drops its leaves in March, and in a few days is again clothed in fully developed foliage of the richest green. The flowers are large, freely produced, curious in form, pink in colour, and highly scented. The solid rusty-coated fruits are about 6 inches in diameter, and contain a quantity of flat circular seeds, rather larger than a sixpence, embedded in their pulp. The tree belongs to the Lecythis family, and it is stated that the hard shells of the fruit are used as drinking vessels.

We may add that Dr. SCHOMBURGK certainly says, that "it is distributed throughout the (forest) region and flowers almost throughout the year*," but that subsequent travellers have never recorded the occurrence of this very peculiar and striking tree, and that we ourselves, during somewhat extensive travels, have never seen it in British Guiana.

The Di-Di or Water-mamma. Among the beings which play a part in Indian folk-lore none is more prominent than the di-di; and the belief in these beings, under the name of water-mamma, is shared by, perhaps has been acquired from, the negroes. Very various accounts are given by different individuals of the bodily form of these beings. The belief has some literary interest owing to the fact that it was almost certainly some di-di story which put it into the head of that quaint thinker and pleasant writer CHARLES WATERTON to make his celebrated "nondescript," by uniting various parts of various animals

* Reisen in Britisch Guiana, vol. iii. p. 1024.

together in the form of an animal apparently more than half-human, which he submitted to a puzzled world as a genuine animal shot with his own gun; and thus, by this grotesque practical joke, drew down upon himself both the unmerited discredit of scientific men for many of his really accurate scientific statements and the half-whispered accusation from the unscientific part of his audience of man-slaughter at least, perhaps of murder. What leads me to allude to the di-di now is a curious passage in a letter from a friend, an educated man and one who knows the wild life of the colony better than any other man, unless an Indian, now living; a man entirely incapable of deliberate mis-statement, who half-thinks, half-doubts that he has seen a didi! This man wrote to me on the 23rd of June in the present year—

"You have, I daresay, heard the Indians speak of *di-dis* and *adopics*, some sort of wild people or 'devils,' they say, seen occasionally in the bush. Well, I will relate to you as I best can what I saw on Saturday last in the bush aback here. It was a rainy afternoon, and I went aback to pick up tonkin-beans. I had a long way to go and did not get any. On my way back I went into the swamp, and was picking up souari-nuts under a tree. The rain had ceased about half an hour before, and, there was no wind at the time. I was stooping down, when I heard the bush near me shake. I looked up and saw a small tree, about 30 yards from me, shaking. I cocked my gun and stepped quickly toward the tree, which continued shaking; as I expected to find some animal rubbing against it. There was a large tacouba* between me and the shaking tree; and when I got about 15 yards from the tree, I saw a something. I could only see the upper part of the object's body—the tacouba and dahlibanna† hid the lower part. This upper part was like the body, as far down as the navel, of a child a little bigger than K—‡ and was quite black, and shone as if it had been varnished. There

* Tacouba is here used of a fallen tree-trunk.—ED.

† Dahlibanna is a low-growing palm (*Geonoma*) found in swamps.—ED.

‡ A child 2½ years old, but large for her age.—ED.

seemed to be hardly any neck; and the head, which seemed much too large for the body, was of a yellowish white. I saw no arms, nor any eyes, nose nor mouth. The object kept swaying from side to side as I looked at it. I fired at it from where I was standing, and afterward went toward the tacouba. I found nothing. I did not go to the spot at once, but waited until the smoke, which hung for a long time, had cleared away: as I was afraid that whatever it was it might turn on me. On going to the spot, I found the small tree cut through by the shot, but could not find where the shot went into the ground, as it ought to have gone, a few feet from the tree. The ground was quite soft and there was a track, like a long and narrow foot without toes; but only two of these, so I could not see in which direction they went. I had had a good look at the object. . . . . . . What could it have been? I do not think there is anything the matter with me to make me see things that do not exist. Still I can hardly in this case believe my own eyesight."

This story will, I hope, interest and puzzle the readers of *Timehri* as much as it has me.

The action of Lime on the Clay-soils of the Colony. Mr. ALEXANDER WINTER of Berbice sends the following interesting note :—

In many parts of the colony there are portions of estates where the soil is so stiff and tenacious, with so small a depth of vegetable mould on the surface that their cultivation is unprofitable. Being desirous of testing the effect of top-dressing of lime on such soils, I made the experiment.

There was in the yard near the manager's house an old horse-trough which had been used for giving the mules their corn in. It was raised from the ground some four feet, was eight or ten feet long and about a foot wide and the same deep. There was a partition in the middle which divided it into two compartments. I filled both divisions with the subsoil clay of an adjoining field. The clay was what is called yellow clay, and was very stiff and dense, about the consistency of putty. To one half I applied a thick dressing of temper lime, to the other nothing, and then left them to be acted on by the atmosphere. The trough being leaky, what rain fell upon it passed readily through; so both divisions had equal drainage

Some months afterwards, on inspection, the two compartments presented very different appearances. The one that had no lime was very little altered; the clay in it was slightly improved by the action of the weather on it, and a few blades of sour-grass had sprung up here and there, but so few they might have been easily counted. The portion which had had the lime showed a thick vigorous growth of vegetation of young plants, some almost small trees, two and three feet high. On pulling up a handful of these, they brought up with them a large bunch of fibrous roots, about a foot in diameter, on shaking which there fell off a quantity of loose mould. On examining further I found that the whole mass of soil, down to the bottom, had been changed from a stiff yellow clay to a loose black garden mould.

Suggestions for a new Forest-law.—The present number of *Timehri* contains much on the subject of forest conservancy; but the subject being one of extreme importance to the colony, and it being desirable to put in accessible form all attainable information on the subject, before any new and important changes are made in the present forest-law, no apology is needed for the insertion of further notes. The following clauses for a new forest-law are suggested by Mr. WILLIAM WALKER, formerly Government Secretary, and on three occasions Lieutenant Governor, of the colony, whose great knowledge of, and abiding interest in, British Guiana must lend great weight to his suggestions. Mr. WALKER writes:—

"There shall be established an office to be called the Crown-lands Department; the head of which shall be the Crown Surveyor for the time being, assisted by such number of assistant surveyors and clerks as the Governor and Court of Policy may from time to time determine.

For the purposes of this ordinance, the several commissaries of taxation shall be conservators of forests within their respective districts.

The duties of the Crown-lands Department shall be to prepare a complete and exact survey of the crown-lands of the colony, excepting such estates as are in actual cultivation, or are actually private property; such survey to be based on the map of the colony prepared by the late Sir Robert Schomburgk, and printed at the expense of the Government in the year 1877; and to show the situation and delimitation of all the crown-forests, the configuration of the ground, the geological character, the general character of its forests and other products, the nature and extent of existing rights and privileges, and by whom and under what authority such rights and privileges are claimed.

It shall be the duty of the Crown Surveyor to mark out the forests into blocks convenient for working, and to prepare working plans for the same. Such plans shall, as far as practicable, embody the following details, that is to say:—

(a) situation: configuration of the ground: underlying rock, if any: surface soil and subsoil: general character of forest growth of principal trees, and of bamboos.

(b) causes of injury, such as fires, game, insects, creepers, epiphytes and parasites.

(c) population, if any.

(d) existing rights and privileges, if any.

(e) demand for forest produce.

Such block-plans shall also specify the general conditions for working such blocks, such as (*a*) the computed annual yield, whether of timber or coppice-fellings and thinnings and collection of minor forest produce; (*b*) protection from fire, cutting creepers; (*c*) planting and sowing; (*d*) other works for reproduction and improvement.

When the maximum yield is determined it should on no account be allowed to be exceeded, and it may often be found expedient to arrange for an intermittent yield. The quantity of timber to be cut, and of other material to be taken out of a forest, in a given time, must be fixed, so as to secure the maintenance and improvement of the production.

It shall be the duty of the Crown-lands Department to prepare and submit for the Governor's consideration and decision, from time to time, plans for the removal of obstacles and for facilitating access to the crown-lands and forests, and for opening up routes to the interior, to facilitate the cultivation of lands and the transport of produce.

A book called the Forest Journal shall be kept, in which shall be recorded all observations and facts required for the preparation of working plans; also records of sales, with prices and names of purchasers, also a bill book with counterfoil, to be used whenever sales are effected, the bill to be issued to the purchaser, the counterfoil to form the office copy.

There shall be a place indicated for storing all timber and forest produce intended for sale; and when logs are received, each shall be entered separately in a book of receipts and measured and marked as shall be directed by the Crown Surveyor. Scantlings to be registered in lots, each piece being marked with the depot-mark, and, when sold, with a sale mark; bamboos and fuel to be entered separately.

The Governor may also issue licences to private individuals or firms to cut and fell timber and other forest produce within such blocks of crown-forests as may be determined by the Crown Surveyor; and all applications for such licences shall be subject to the terms and conditions specified in this ordinance.

All persons holding such licences shall be bound to pay a royalty of such amount as the Governor may from time to time determine upon each cubic foot of hewn or squared timber, and upon each lot of bamboos or other forest produce; the amount due in each case to be certified upon measurements by the Crown Surveyor or one of his assistants. Licences to burn charcoal to be issued separately and limited to such trees or cuttings as shall be specified; a royalty to be paid to the conservator of the district in which such forest blocks are situated, and by him paid to the Receiver General for the public use.

Groote Creek.—As an example of the difficulty which will be experienced in reorganizing the Crown-land system, from the fact of the uncertainty of the ownership of considerable tracts, the history of the claim at present made by certain private individuals to the important tract of forest lying along Groote Creek, on the Essequibo River, is instructive. Rather more than twenty-five years ago commissioners were appointed to

enquire into this claim; and it is from the report of these commissioners, dated on the 24th of January 1855, that most of the following facts are taken. According to the title-deeds laid before the commissioners by the claimants to Groote Creek, the place was first granted by HERMANN GELSKIRKE, then commander of the colony of Essequibo, on the 12th of January 1793, to CORNELIUS BOTER, one of the members of the Council of Policy; but this grant was not recorded in the Government Secretary's Office until the 21st of January, 1814. The grant recorded in 1814 was possibly an original document; but by 1855 this deed had been lost, and all that was submitted to the commissioners who reported in that year was a certified copy, obtained from the record book in 1823. According to this copy the original grant was signed, as above stated, by Governor GELSKIRKE in 1793. But GELSKIRKE had died in, or before 1742; at least, in September of that year his heirs made application to the Council of Policy relative to the boundary of their land; and in the previous July STORM VAN GRAVESANDE was provisionally appointed Governor. Thus even according to the claimants, the grant under which they claimed had been signed in 1793 by a Governor who had died in 1742! "But, now, (say the commissioners of 1855,) should the "supposition, which does not appear unreasonable, be "adopted that the clerk in recording in 1814 the original "grant made a clerical error in the date, we have then "to consider whether the conditions of the grant have "been fulfilled. By that document, the grantee was "bound to cultivate the land and to have sugar-works "erected. The place is now, and has for the last sixty

" years been, in bush; and we are, therefore of opinion " that, the special object for which the land was given " not having been carried out, the grant became liable to " forfeiture and the crown is at liberty to resume. * * * " We see no occasion for entering into an examination " of these claims (*i. e.* those of 1855) as they all rest " on the original grant to CORNELIUS BOTER." Who the claimants at this present time are seems uncertain; but there is some sort of descendent of one of the claiming families who resides on Groote Creek and claims to exercise all the rights of ownership. But even supposing that the grant was legitimate, *i.e.* that it was only post-dated by a clerical error, and supposing further that the conditions of cultivation imposed by the deed of grant had been observed, the grant was one which must impose considerable difficulty in the definition, in these days, of the Crown Lands; for the only limits set by the document to the Groote Creek grant were, that it was to extend as far 'as the tide runs upward'. The result of all this now is that nearly all the timber sent away from the Essequibo is taken from Groote Creek; for the wood-cutters can get it from there at a cheaper rate than by taking out a wood-cutting licence from the Crown. For instance, at the end of 1879 the state of the case was that the wood-cutters of the Essequibo had, with two exceptions, given up cutting wood elsewhere than in Groote Creek; and even of these two exceptions one was taking timber from Groote Creek as well as from his own grant, and he intended to abandon the system of taking out grants as soon as his licence expired.

Indian Privileges.—Another matter requiring careful consideration in any re-arrangement of our forest laws is the system of privileges allowed to the aboriginal Indians, whose homes are in the forests with which such law must deal. The privileges now allowed to these people were stated in the *Official Gazette* of the 12th of September, 1871. They are as follows:—

1. All such aboriginal Indians shall be at liberty to cut on any land of the Crown not licensed or granted to, and not in the lawful occupation of, any person, timber, to be used by them or to be disposed of by them in the shape of squared timber, under the restrictions hereinafter set forth, and of a size which will square not more than twelve inches.

2 They shall be at liberty to cut or gather on any such land of the Crown as aforesaid, any troolies, palm, or other leaves, and to make any shingles from trees of whatever size, growing on any such land of the Crown, and to burn any charcoal on, and to dig, remove, and carry away any soil, rock, stone, sand, or other substance or thing, except minerals, from, any such land of the Crown.

3. Provided that they shall not be at liberty to dispose of any timber or shingles to any person engaged, or to any person employed by any one engaged, in the business of wood-cutting; and any timber or shingles that may have been cut or made by any aboriginal Indian, and that shall be found in the possession of any person engaged, or any person employed by any one engaged, in the business of wood-cutting, shall be liable to seizure, and if seized, shall be forfeited in the same way as if such person had cut or made such timber or shingles on lands of the Crown not licensed or granted to, and not in the lawful occupation of, any person.

4. Provided further, that if ardent spirits, or intoxicating drink of any description, shall be given by any person to any aboriginal Indian, in full or in part payment for any article or articles whatever mentioned or referred to in these regulations, disposed of by such Indian, such article or articles, and all articles whatever mentioned or referred to in these regulations disposed of at the same time, shall be liable to seizure in the possession of such person, and, if seized, shall be for-

feited in the same way as if such person had cut, gathered, made, burnt, or dug, or had removed or carried away, such article or articles on, or from, lands of the Crown not licensed or granted to, and not in the lawful occupation of, any person.

These regulations are undoubtedly productive of evil, in more ways than one; and a change in them is needed. The Crown Surveyor in his official report for 1881 proposes certain definite alterations in these. He would have them as follows :—

1. All aboriginal Indians shall be at liberty to cut on any crown-land not granted to, nor in the lawful occupation of, any person, timber to be used by them or to be disposed of by them, in the shape of squared timber, under the restrictions hereinafter set forth and of a size which will square not less then eight inches.

2. They shall be at liberty to cut and gather on any such land of the crown as aforesaid any troolies, palm, or other leaves, and to make any shingles from trees of any size, and to burn any charcoal on any such land of the crown.

3. No aboriginal Indian shall be at liberty to dispose of anything, shingles, staves, beams, posts or spars, to any person whatever, but all such shall become the property of the Government, to be applied in the construction of public works, and they shall be remunerated therefor in such manner as His Excellency the Governor shall deem most conducive to their interest, value at not less than the current market rates being allowed to them.

4. Any timber, shingles, staves, beams, posts, or spars that may have been taken from the crown forests by any aboriginal Indians, and that shall be found in the possession of any person other than an aboriginal Indian shall be forfeited in the same way as if such persons had made such shingles, or cut such timber, staves, beams, posts or spars, on lands of the crown not in the lawful occupation of any person.

5. His Excellency the Governor shall from time to time appoint such depôts for the reception of timber (etc. etc.) made by Indians, on the different rivers, as he may deem réquisite. Under these regulations they will be permitted to dispose of charcoal, troolies, palm, or other leaves to any person.

The great feature in these suggested alterations is the prohibition of Indians from selling the timber which they may cut to any but official persons and for the purpose of the public works. This would bear very hardly on the Indians, who cut timber only in very small quantities at a time, and, more often than not, in places very remote from those where depôts are likely to be established, unless these depots should be very numerous and widely distributed, and who would constantly infringe these regulations to avoid carrying their timber far and undergoing the formalities which would surely be observed at these Government depôts; and it would bear more hardly on the other inhabitants, not wood-cutters, of the more remote districts, where it is so difficult and expensive to procure imported timber, that colony wood, cut by Indians, is employed for almost every purpose. As a matter of fact, while the licenced wood-cutters are, as a rule, the wholesale cutters of, and dealers in, timber, the Indians (together with the robbers of crown timber—whose trade ought certainly to be stopped) are the very necessary and useful retail dealers. Moreover the suggested alterations do not meet the real difficulties of the case, which are two in number. In the first place, a difficulty exists in the fact that a large number of people of more or less mixed blood, some having almost no Indian blood in their veins, nearly all having more negro than Indian blood, claim the privileges of Indians in cutting timber. Among these people of mixed blood—cobungrus, they are called—are some who in habit and thought are really Indians; and it would be hard to take from these their privileges as Indians. Others

are of purely negro habits. And it is very difficult to draw a line between these two classes. The second difficulty lies in the fact that to restrict Indians from cutting wood—and by wood, in this colony, is virtually meant, greenheart—above a certain diameter is to force them to cut the small, immature greenheart which it is a matter of extreme importance to leave, to replace the forest.

Sir Joseph Hooker on a new Botanical Genus from British Guiana.—The following letter received by Mr. JENMAN from Sir JOSEPH HOOKER is of considerable interest. It should be stated that—by a slight mistake—the writer wrongly attributes two of the species to which reference is made to me and refers only one to Mr. JENMAN; whereas Mr. JENMAN really sent two, I only one; though mine was the first. The letter is as follows:—

"I have just concluded the study and description of the most curious "new genus about which you ask, and of which there are two species, "both sent by Mr. IM THURN, and one by you also. One of them is "a published plant, appearing in RUDGE'S "*Plantarum Guianæ* "*Rariorum Icones et Descriptiones*" as *Mnasium sphærocephalum* "*Mnasium* is, however, equivalent to *Rapatea*; and, as a new generic "name for the Guiana plants must be found, I have called the genus "*Thurnia*, and the two species

T. sphærocephala (the one with serrated leaves).

T. Jenmanni.

"The development of the seed in *Thurnia* is most extraordinary, and "we much want fertile flowers in all stages of growth, in spirits, of "both species. We have only fertile (flowers) of *T. sphærocephala* and "only barren of *T. Jenmanni.* Quite a small phial would hold enough "pieces of the heads for analysis. Please get them if you can when "you go on to the savannah................I am figuring both *Thurnias*'

" and will send you figures and descriptions in proof. The genus belongs " to *Junceæ*, and, though very unlike, is nearer to *Luzula* than to any " other. It is a most curious genus".

The two plants in question are the same as those mentioned by Mr. JENMAN, in his paper on the Kaieteur Savannah (see *ante* p. 249) as 'types of a new genus...... placed, I believe, near *Typha*'. Both Mr. JENMAN and I gathered our specimens on the same remarkable savannah.

Sir JOSEPH HOOKER'S descriptions and figures of these plants will probably be reproduced in the next number of this journal.

Couvade.—Perhaps the most extraordinary practice ever found very widely spread among men is that known by the name of 'couvade'; yet this has been observed, either in full operation or still discernible in faint traces, among innumerable races and in almost every part of the world. Many so-called savages, among others our Guianese Indians, still regularly practise couvade; and among many of the most highly-civilized people, as for instance the Germans, traces of the former existence of the practise may still be detected. In all probability indeed, it has been an universal custom, observed in every race during a certain stage in the development of its civilization.

Couvade, in its best known form, consists in the father of a new-born child retiring to his bed or hammock, treating himself carefully, and being carefully treated by others, in a way which at first sight appears as though *he* were regarded as weakened by the effects of the birth. Generally too, though this is not an essential part of couvade, the mother of the child, hardly suffering, as

is ever the case with women accustomed to hard work, from child-birth, resumes her ordinary tasks almost simultaneously with the lying-down of her husband.

Many attempts have been made to explain this most curious custom. It is, writes Mr. RUSHTON DORMAN,* "a superstition that has come through fear of attacks of evil spirits. In the couvade the man takes to his bed . . , *and kills no animals.* This fear of killing animals and of carrying on their ordinary avocations arises from the supposition that the spirits of the animals will take advantage of the helplessness of the child and avenge themselves upon it . . Among the Arawaks the father can kill little birds and fish, but no large game". In short, according to Mr. DORMAN, the essence of the matter is that the father avoids enraging any animals which might have power to avenge themselves on his child. But, if this is the full explanation, why should the father take to his hammock and be nursed; why should he abstain from such of his ordinary occupations as can not be supposed to enrage other beings? Mere abstention from the killing of animals would be sufficient. Moreover, for the statement that the Arawaks during couvade kill small, powerless animals but not such as are large and dangerous, Mr. DORMAN gives no authority, nor can I find any, or any ground whatever. Again, writing with more especial reference to the Indians of Guiana, the Reverend C. D. DANCE † gives another, and in some ways more probable, explanation.

* "The Origin of Primitive Superstitions", by RUSHTON M. DORMAN Philadelphia and London, 1881, p. 58.

† "Chapters from a Guianese Log-book". Demerara, 1881, p. 148.

"The husband, pleased that a man or woman is born into the world, and himself the honoured cause, reclines complacently in his hammock, and receives the compliments and congratulations of visitors. Nor does he leave the house until after the expiration of a certain time: for well he knows (if belief is certain knowledge) that the simple spirit of the newly born infant recognizes in him paternity and headship of the house. The infant spirit then clings to the father, gazes upon him, follows him wherever he goes, and for a time is as intimate and familiar with the father as he is with his own infant body, with which the infant spirit is only recently associated.

One would, perhaps, have thought that the mother should claim the most intimate relationship; but it appears that a priority of affinity is established with the father, as progenitor of the infant spirit.

How then can the father resign his recumbent position in the hammock, or his careful and limited walk within the precints of the dwelling, and go out to the forest or field, to use an axe or cutlass, when the spirit of the child, which follows him as a second shadow, might be between the axe and the wood? How climb a tree, if the infant spirit is also to essay the climbing, and fall, perhaps, to the injury of the infant lying in the hammock? How hunt, when the arrow might pierce the accompanying spirit of the child, which would be death to the little mortal at home?

If, wandering through the woods, you happen to meet a *tairu* leaf formed very much in the shape of a corial (canoe), floating on a stream or pond, and furnished with a tiny wooden seat and paddle cut out and placed therein; or should you, on stepping over a fallen tree, discover two sticks, each placed from the ground to the trunk of the tree, disturb them not, for they are sacred to a father's affectionate anxiety for the preservation of the infant spirit of his child. When the father wades through the water, the toddling spirit of the infant must paddle across in the tairu-leaf boat; and when his sire crosses over the stump, the little temporary bridge enables the infantile spirit to climb over.

Thus the spirit of the child follows its father to the fields and returns with him to the house, to gamble between father and child, until age and some mysterious increasing sympathy attaches it exclusively to the body of the child whose spirit it is.

But notwithstanding the greatest vigilance, the little spirit is some-

times lost, and then the body pines and dies if the piai-doctor, called in for the occasion, is not fortunate enough to recover the stray spirit."

This explanation by Mr. DANCE, though I am not prepared to accept it, at least in its entirety, seems to me worthy of serious consideration. Meanwhile, there are some facts which seem to me closely connected with the subject of couvade, and the statement of which, they having never yet, as far as I know, been recorded, is the object of the present note.

It seems to me not yet to have been clearly recognized that there are other practices beside that already described as the generally recognized form of couvade which are almost certainly akin, and ought to be classed under the same name. If so, the time may perhaps come when it will be possible, by studying not only the one recognized form of couvade, but also and in conjunction, all the various forms of the practice, to detect the idea underlying all these and on which they are based: and thus the long, and as yet vainly, sought explanation of couvade may be found. As a contribution toward this desirable end the following examples, as I think, of couvade, occurring in unusual forms in Guiana, are offered :—

(1.) When an Indian, with the help of his dog, has captured game, his wife, if she is at the time with child, must not eat of the booty; for, if she does, the dog will never hunt again.

(2.) A woman with child may step across the most dangerous snake; for it will not bite her.

(3.) A certain well-known colonist, an Englishman, now dead, who was present while some Indians, according to their practice, were poisoning the water of a small stream with the narcotic substance known as haiari, was prevented by the Indians from touching the water; for if he had done so, as his wife was then with child, the

haiari would have lost its narcotizing properties and the fish would have escaped.

(4.) While I was travelling with the same Macusi Indians on the Takootoo River, at a time when there was famine in that district and food was very scarce, a Macusi who was with me refused to eat the only meat which we had with us; for we were to arrive at his house in a day or two and he was to be married, and if he had eaten of this meat so near the time of his marriage, evil would have befallen him or his wife or his future children.

Many similar examples might probably be collected both in Guiana and elsewhere; and by their publication the ethnologist might be greatly helped towards an explanation of couvade. Any correspondents who will help in this matter by sending instances which have come under their own observation to the editor of this journal will deserve our gratitude.

The Pronunciation of Timehri.—To speak of oneself is in almost all cases wearisome to one's hearers. The indulgence of the reader must therefore be requested for the few words which it seems desirable here to say of ourselves, that is of this journal. The first number has been received, almost without the slightest exception, with most gratifying favour. The one very slight exception is that one or two among our many kindly critics have complained of the difficulty of knowing how to pronounce our name, *Timehri*. The difficulty is chiefly due to the fact that the spelling which we adopted for the word is that which, though it is not strictly phonetic, has been used by the very few writers who, before this journal was started, had had occasion to use the word. It may be removed by stating that the two latter

syllables of the *Timehri* should be pronounced as though rhyming to 'merry'.

EVERARD F. IM THURN.

Report of the Meetings of the Society.

Meeting held 13th July.—The Honourable W. Russell, Vice-President in the chair.

There were 13 members present.

Elections.—*Member:* His Honour Francis Fleming.

Associates: Frank Fowler, Donald Smith, William McKenzie, A. C. Marshall, J. C. McDonell, George T. Duffield.

Discussions at the Meetings—On the suggestion of the chairman it was agreed that at the next meeting further discussion on papers formerly read should be invited.

Sir John Scott.—The secretary stated that the directors, considering it desirable to obtain a portrait of Sir John Scott, to be placed among the other portraits of Governors of the colony which had been presented to the Society, and having communicated with Sir John Scott on the subject, the latter had been good enough to send the portrait now on the table.

It was ordered that the best thanks of the Society be sent to Sir John Scott for this gift, and that the portrait be placed in the Reading Room.

The chairman placed on the table several copies of a letter dated 4th instant, addressed by him to the Hon'ble W. A. G. Young, on the East Coast Water supply.

The thanks of the meeting were given to the chairman.

The following communication from F. A. Trew of Pln. *Smythfield*, to the Hon'ble W. Russell, dated 3rd

July, as to the destruction of rats on plantations, was read :—

Smythfield, 3rd July, 1882.

The Hon. W. Russell.

Sir,—I take the liberty of bringing to your notice a matter which, (though trifling in itself, may still be of some interest) regarding the rat-pest to which most of our estates, I fancy, are subject. I am led to do so from reading in the *Daily Chronicle*, some extracts on the "mongoose" and the value of which it has proved itself in Jamaica since its introduction there on the sugar-estates.

It recently came under my observation in certain fields aback of the estate on which I was that the stumps of trees which were scattered here and there throughout the comparatively new land and which had not quite decayed were in the evening, as also in the early morning, taken possession of generally by birds of prey such as buzzards and the smaller hawks, which are numerous out here. They were evidently watching the trash-banks, and rats were their game. As a rule we paid some $20 a week for killing rats, but I noticed that in these fields we were particularly free of them and suffered in no way from their depredations. It is a noticeable fact, at least it has been so with me, that we have few hawks out here such as those at home which hover over their prey on the wing, pouncing from a height on their quarry. The species here is more of the buzzard habit which lies in wait for its meal, and as I already said they are pretty numerous with us. I would therefore suggest as an experiment that posts or light spars should be planted here and there in fields as roosts for these birds, and I trust you may not think me chimerical in making it; these posts could be very easily shifted at intervals and no large number would be required; it could only be in fields newly cut, up to say three months of age, that the idea would be likely to answer when the posts would then of course be removed entirely. The cost in any case, however, would certainly not be great.

I am, Sir,

Your obedient Servant,

FRA. A. TREW.

On the motion of the chairman it was unanimously agreed that the thanks of the Society be given to Mr.

Trew for the valuable practical suggestion contained in his letter.

The following donations to the Society were announced and thanks ordered to be given to the donors :—

Report of the Commissioners appointed to inquire into the working of the office of the Administrator General of British Guiana, from the Government Secretary.

Edinburgh University Calendar, for 1882–83, presented by Lady Chalmers, at the request of Professor Wilson of Edinburgh.

3. Parliamentary Debates from 1668 to 1796, presented by the Hon. N. D. Davis.

4. Visit to Madeira in 1881, by J. C. Gomes, from the author.

The meeting then terminated.

Meeting held 10th August.—The Honourable Thomas Mulligan, President, in the chair.

There were 10 members present.

Elections.—*Associates:* William Shankland, John Slater, Bartholomew A. Day, James Mann.

Proposed Annual Dinner.—On the suggestion of the Honourable Wm. Russell, seconded by Mr. T. H. Glennie, it was agreed to appoint a committee to consider the desirability of having an annual or occasional dinner in connection with the Society and as a means of bringing its members together.

The following gentlemen were placed on this committee.

The President, the Hon. W. Russell, the Hon. N. D. Davis, Mr. W. S. Turner and the Secretary.

Systematic Agricultural Experiments.—The Honour-

able W. Russell, having called attention to the suggestion made some time ago that Mr. Francis, the Government Chemist, and Mr. Jenman, the Government Botanist, should be associated in making experiments on the soils of the colony and on the capacity of these for the production of special subjects, gave notice that at the next meeting he would bring forward a resolution to the following effect :—

" Whereas there are now attached to the Government of this colony " two officers, namely Mr. Francis, the analytical chemist, and Mr. " Jenman, the government botanist, both members of this Society, and " highly distinguished in their respective callings; and whereas these " gentlemen have expressed their willingness to give their services to " the Society in the prosecution of systematic research into the capa- " bilities of the soils of the colony for raising particular products, and " to find out as far as possible what treatment and fertilizers are " required in order to obtain the best results; and whereas in order to " carry out these researches in a proper manner, and on a scale which " the importance of the subjects demands, a roomy laboratory roofed " with glass and furnished with suitable earthenware glazed vessels for " the reception of soil and plants, is absolutely necessary:

" Be it resolved that a deputation be appointed to wait upon His " Excellency the Governor, to explain the object of the Society as " above detailed, with a view to asking his assistance in the matter, " and obtaining permission for Messrs. Frances and Jenman giving " their services in the manner proposed; and in the event of receiving " a favourable reply from His Excellency that a subscription list be " opened, and members of the Society be invited to contribute towards " raising funds to cover the necessary expenditure".

Amsterdam Exhibition of 1883—A letter from Mr. William Walker, dated 1st July, with reference to the representation of this colony at the International Exhibition to be held at Amsterdam in 1883, and enclosing letter from Mr. P. L. Simmons, offering his services-to arrange any contributions which may be sent, was read.

The President having asked how the matter at present stood with reference to the Exhibition, the secretary stated that so far as this Society was concerned, a communication from the Government Secretary on the subject of the Exhibition, dated 2nd June, had been read; and in accordance with the instructions then given he had written to the Government Secretary on 9th June stating the views of the Society with reference to the Exhibition, and offering on behalf of the Society to do whatever might be in their power to promote the object in view, if adequate funds are provided and placed at their disposal, but that no answer to that letter had yet been received.

The secretary was directed to call the attention of the Government Secretary to the letter of the 9th of June, and to forward a copy of the communication now read, with a request that some decision may be made as soon as possible.

An Agricultural Experiment—The secretary then read a communication received from Mr. Alexander Winter, of Berbice, "on the action of lime on the clay soils of the colony", intended as a contribution to the Society's journal.

On the motion of Mr. Russell, it was unanimously agreed that the best thanks of the Society should be given to Mr. Winter for his most interesting communication. *

Donations.—The following donations to the Society were announced and thanks ordered to be given to the donors:—

Barbados Agricultural Gazette **of 1st July, with Meteorological Tables to date.—From His Honour Mr. Justice King.**

* See p. 300.

The Canadian Patent Office Record for April, 1882.—From the Government Secretary.

18 Volumes of Books and Pamphlets.—From the Revd. Thomas Farrar.

The meeting then terminated.

Meeting held 14th September.—The Honourable William Russell, Vice President, in the chair.

There were 9 members present.

Elections.—*Associates:* Stanley Thornhill, William Mears.

Dinner Committee.—It was announced that the committee appointed at the last meeting to report on the advisability of holding an occasional dinner in connection with the Society had, as yet, been unable to meet.

Systematic Agricultural Experiments—With reference to the notice of motion given at the last meeting as to systematic researches into the capabilities of the soils of the colony and other purposes, it was agreed to postpone the discussion of the subject till next meeting, when Mr. Jenman would probably be present.

Meanwhile, the chairman laid over a plan for a laboratory and conservatory such as he considered would be suitable and necessary for carrying on the proposed researches, and asked Mr. Williams to give his assistance by examining the plans and making such suggestions as he might think proper.

The Journal.—The chairman called attention to the Journal of the Society, *Timehri,* the first part of which was published in July last, and expressed surprise that

no formal notice of the publication had been taken at the last meeting of the Society. This was probably in consequence of the pressure of other business; and he moved that the thanks of the Society be tendered to Mr. im Thurn for the very creditable manner in which the Journal had been commenced.

The motion was seconded by His Honor Mr. Justice King and carried unanimously.

It was then moved by Mr. Williams, seconded by Mr. N. D. Davis, and carried unanimously, that the thanks of the Society be tendered to those who have contributed papers to the Journal.

The Curator of the Museum.—On a question being asked by Mr. Williams as to what was being done to obtain the services of a curator of the Museum in place of Mr. im Thurn, the chairman mentioned that Mr. im Thurn was taking a general interest in the Museum, collecting for it, and giving his services as far as he could to the Society.

Mr. Williams said that he knew a person who would be willing to assist in preparing a catalogue if Mr. im Thurn wished such assistance.

The chairman and secretary both stated that they believed that a catalogue was in course of preparation, but that it had been delayed in consequence of the setting up of specimens for the Museum not having been completed. The secretary also stated that Mr. Walker, on behalf of the Society was still engaged in correspondence with Sir Joseph Hooker at Kew, as to obtaining the services of a competent curator, but without having as yet succeeded.

The chairman mentioned that steps were being taken to bring the matter of the curatorship before the Court of Policy, and that a resolution would be submitted having for its object to create the curator of the Museum and secretary to the Committee of Correspondence an official or public officer, as the best means of getting a man of first-rate ability, who would not be likely to be enticed away to join some other branch of the public service.

The Exhibition Medals.—The secretary reported the arrival from England of a portion of the medals awarded at the late Local Exhibition, and mentioned that the box had not been opened, as it was desired to check the contents with the list kept by Mr. im Thurn when the medals were ordered.

Amsterdam Exhibition.—A letter from the Government Secretary, dated 25th ultimo, was read, acknowledging receipt of the Society's letter dated 11th ultimo enclosing a copy of a communication from Mr. W. Walker on the subject of British Guiana being represented at the International Exhibition to be held in Amsterdam in 1883, and acquainting the Society in reply that the Governor does not propose to ask for a vote of public money for the purpose in question.

The secretary stated that he had, with some difficulty, been enabled to send a copy of that letter to Mr. Walker by the mail which left on the 25th ultimo, as he believed that it was important not to lose time in communicating to him the fact that this colony would not be represented at the Exhibition.

It was then agreed that the Society had done everything that it could to secure the representation of the

colony at the Exhibition and that nothing remained to be done but to give such information as the secretary possessed to intending contributors, if any.

The secretary stated that he thought contributions might be forwarded through Mr. Walker, as resident director of the Society in London, or Mr. P. L. Simmonds, Crystal Palace, London, S. E.

Seismology—A letter from the Government Secretary, dated 1st instant, was read stating that a request had been made to this Government through Sir Henry Parkes, Her Majesty's Minister in Japan, on behalf of the Seismological Society of Japan, for information respecting earthquake phenomena in Central and South America, and enclosing the copy of a letter from Mr. John Milne, the Vice President of the Society, and several pamphlets to which he referred.

The secretary was directed to acknowledge the receipt of these communications, and to state in reply that, so far as the Society can learn, no data exist in the colony which would enable them to give the required information.

The following donations to the Society were announced and thanks ordered to be given to the donors :—

The British Guiana Blue Book for 1881, by His Excellency the Governor.

From G. H. Hawtayne, 22 Volumes of Books.

From J. A. Tengeley, 3 Volumes.

From His Honour J. Hampden King.—The Barbados *Agricultural Gazette and Planter's Journal* for August, with Metereological Tables.

The meeting then terminated.

Meeting held 12th October.—The Honourable Thomas Mulligan, President, in the chair.

There were 10 members present.

Elections.—*Members* :—W. Hellier Hutchins, William Nicholas Lynch.

Associates :—Charles Eugene Johnson, William Elliot.

Dinner Committee.—It was stated that the dinner committee were not yet prepared to make any report.

Systematic Agricultural Experiments.—The Honourable William Russell brought forward the motion of which he had given notice at a previous meeting, with reference to systematic researches to be made by Messrs. Jenman and Francis into the nature and capacities of the soils of the country.

The motion having been seconded by the chairman, was carried unanimously.

Mr. Jenman stated that he considered the plan proposed in the motion to be very feasible, and, without knowing what Mr. Francis's views might be, he was prepared to give his services in the matter.

The chairman said that, having spoken to Mr. Francis on the subject before he left the colony, he knew him to be in favour of the scheme.

After some discussion it was agreed that the matter should be referred to the following committee for report, for the information of the Society, before appointing a deputation to wait upon His Excellency the Governor, viz., Messrs. Russell, Jenman, Williams and H. T. Stokes.

The Microscope—It was agreed that rules should be drawn up for the use by members of the Society of the

microscope now in the Museum, and that this should be entrusted to Mr. Jenman for the present.

The Journal.—Allusion having been made to the price of the journal of the Society, the secretary stated that the possibility of reducing the price at the end of the present year was now under consideration.

The meeting then terminated.

Meeting held 9th November.—Mr. W. H. Sherlock in the chair.

There were 9 members present.

Elections.—*Members :*—J. A. Potbury, B.A., R. M. Freeman, M.D.

Associates :—James Puddicombe, Frederick E. Greene.

The Annual Dinner.—The proposal to hold an occasional dinner in connection with the Society having again been brought forward; after some discussion, it was moved by Mr. Campbell, seconded by Mr. Kelly, and agreed :—

"That the first of the proposed dinners should take place on the an-"niversary of the Society, on the 14th March next or the nearest "convenient day before or after that date".

Systematic Agricultural Experiments.—The secretary stated that no report had been received from the committee appointed to consider Mr. Russell's proposal to erect a laboratory for experimental purposes; but he read the following letter on the subject, from the Honourable Mr. Russell :—

Steamer Guiana, 6th November, 1882.

DEAR MR. CAMPBELL,—I am reminded that it will be quite out of my power to attend the meeting of the Royal Agricultural Society on Thursday, as I shall be in the Corentyn district that day. for which I am

sorry, as I wanted to go more fully into the question of the experimental laboratory, now that Mr. Francis is again in the colony.

In further elucidation of my proposal I now beg to hand you the Sixth Annual Report of the proceedings of the Aberdeenshire Agricultural Association, and I particularly call the attention of the Society to the remarks made by M. L. Grandeau, of the University of Nancy, on the success of the Aberdeenshire Association, especially where he says, "Happy country where the private initiative permits of constituting, without any personal aim, and for the general interest, a scientific association on so large a basis," at page 6. It is in the same line of argument that I have endeavoured to lead our Society up to the same way of dealing in a practical way with kindred subjects in British Guiana, and I will thank you to lay this report on the table for the use and information of members.

You are aware that Mr. Jamieson has a small retainer for carrying out the objects for which the Aberdeenshire Association was started, and I am of opinion that Mr. Francis should be dealt with in a similar way. My idea is, after the preliminary expenses of procuring the necessary building and appliances, that parties wishing to have soils tested should pay for the quantitative analyses of such soils according to the scale laid down by the Government, and that the investigations made in carrying out the after-experiments in the laboratory should be *pro bono publico*; and it will be for Mr. Francis to say what additional fee he would claim from the Society for this additional work.

These are the points which I would raise if I could have been present. In fact I think that the reports in question, which I have handed in from time to time, might be taken as the groundwork on which our Society should build up a similar undertaking.

I might also call attention to page 33, where Mr. Jamieson in summing up throws out some grand hints as to the future. Are we of British Guiana behind the farmers of Aberdeenshire? I say we have no right to own up to such an impeachment.

The following are the passages in the report to the Committee of the Aberdeenshire Agricultural Association by Mr. Thomas Jamieson, F.I.C., referred to by Mr. Russell:—

Alluding to the Aberdeenshire experiments, M. Grandeau records:—"I cannot, as I should wish, present even an incomplete analysis of the

five annual reports of Mr. Jamieson, on the work of the Agricultural Association of Aberdeen, without going beyond the limits of the report of the work of the International Congress.

"The reports of Mr. Jamieson comprise, indeed, with their appendices, about 200 pages of text in folio, with numerous tables giving the results of the experiments commenced in 1876 by the Association, and continued without intermission since that time. To my regret I find myself, therefore, obliged to confine myself to making known briefly the aim and organisation of the Association, the method of its experiments, and the principal results obtained, as far chiefly as concerns the *rôle* of the divers phosphates in vegetation.

The organisation of the Association of Aberdeen is quite special; its installation partakes at once of the private laboratory and the agricultural station. Formed by the union of a certain number of agriculturists and friends of agriculture, who have engaged for a series of years to contribute annually from £1 to £50 each, this Association undertakes researches and experiments like those which Mr. Lawes has pursued for 40 years in his private laboratory at Rothamstead, and makes no analyses for the public. The constitution and object of the Aberdeen Agricultural Association were defined, at the opening meeting of the members in April, 1876................ (see Report or 1875-76). The subscriptions for 1880 amounted to £358. Quite recently, under the impulse of Mr. Jamieson, a second Association of the same kind has been founded in Sussex, the members of which engage for a period of three years to subscribe £814 annually.

"Happy country, where the private initiative permits constituting, without any personal aim, and for the general interest, a scientific association on so large a basis.

"The Aberdeenshire Association commenced its researches by trials on the cultivation of turnips in fields variously manured, and notably with phosphate of animal origin, bone flour deprived of nitrogenous matter, raw mineral phosphates finely ground, superphosphates from bone and minerals and precipitated phosphate, all these phosphates being employed both alone and associated with nitrogenous manures. After the turnip experiments came experiments on other crops.

* * * * *

"The Committee feel confident that the formation of Agricultural Associations on the Aberdeenshire model would prove of incalculable value.

"To acquire 50 acres of land, to be farmed with the view of exemplifying the most profitable system of farming, for applying the most advanced systems in regard to implements, choice of crops, manures, feeding of various classes of animals, &c., all with the object of *maximum production*, combined with *greatest profit* to the producer, the financial result to be fully given in a simple but accurate system of farm bookkeeping.

"It would be looking too far into the future to speak of what such an organization might form the nucleus, but it will be seen that it might develop into a permanent experimental station and farm, with an Agricultural School and Agricultural Museum, and thus attain, in the fullest degree, the second general object of the Association, as stated in their first publication, viz:—" To advance and aid in such way as may be deemed expedient the knowledge of Agricultural Science."

The chairman suggested that the discussion be deferred until the report of the committee was before the Society; and the secretary suggested that a copy of the letter be sent to the committee, with the request that they should bring up their report at the next meeting.

These suggestions were agreed to.

The following donations to the Society were announced and marks tendered to be given to the donors:—

From Dr. Belmonte, a new and complete map of the colony of Dutch Guiana, recently published, according to surveys made in 1860-69 by order of the Government of that colony.

The *Barbados Agricultural Gazette* of the 1st October, by his Honour J. Hampden King.

Sixth Annual Report of the Proceedings of the Aberdeenshire Agricultural Association by the Honourable W. Russell.

The meeting then terminated.

Anniversary Meeting held 14th December.—The Honourable Thomas Mulligan, President, in the chair.

There were 12 members present.

Elections.—*Member* :—Thomas Shields.

Associates:—J. J. Grayfoot, F. C. S. Bascom.

Election of Officers.—The following officers and committees were appointed :—

Patroness:

THE QUEEN.

Vice-Patron:

HIS EXCELLENCY SIR HENRY TURNER IRVING, K.C.M.G.,
GOVERNOR AND COMMANDER-IN-CHIEF, &c., &c., &c.

Office Bearers for 1883:

President:

HON. WILLIAM RUSSELL.

Vice-President:

HON. B. HOWELL JONES.

Managing Directors:

B. J. GODFREY
G. H. HAWTAYNE
C. H. GILBERT.

Ordinary Directors:

GEORGE L. DAVSON
HIS HONOR J. HAMPDEN KING, B.A.
R. J. KELLY
HON. THOMAS MULLIGAN
HON. ARTHUR BRAUD
M. GARNETT.

Exchange Room Directors:

JOHN J. DARE
ARTHUR WEBER
EDWARD STEPHENS.

Treasurer:

ROBERT WIGHT IMLACH.

Secretary:

WILLIAM HUNTER CAMPBELL, LL.D.

Agricultural Committee:

HON. WILLIAM RUSSELL, *Chairman.*
A. J. PITMAN, *Vice-Chairman.*
R. T. A. DALY, *Hon. Secretary.*

W. S. ARNOLD
C. L. BASCOM
S. M. BELLAIRS
HON. ARTHUR BRAUD
D. C. CAMERON
W. H. CAMPBELL, LL.D.
WILLIAM CRAIGEN
M. GARNETT
A. R. GILZEAN
T. H. GLENNIE
R. W. IMLACH
HON. B. HOWELL JONES
R. J. KELLY
HENRY KIRKE, M.A.
A. C. McCALMAN
E. A. MANGET, M.D.
JOHN MENZIES
JOHN MINTY
HON. THOMAS MULLIGAN
G. R. SANDBACH, M.A.
HENRY T. STOKES
W. A. WOLSELEY.

Committee of Correspondence:

W. H. CAMPBELL, LL.D., *Chairman.*
HIS HON. J. H. KING, B.A., *Vice Chairman.*
R. W. IMLACH, *Treasurer.*
EVERARD F. IM THURN, *Secretary.*

N. ATKINSON
REV. W. G. G. AUSTIN, M.A.
R. T. A. DALY
HIS HON. F. FLEMING
E. H. FRANCIS
WILLIAM FRESSON
C. H. GILBERT
T. H. GLENNIE
B. J. GODFREY,
G. H. HAWTAYNE
JOHN S. HILL
G. S. JENMAN
R. J. KELLY
HENRY KIRKE, M.A.
GEORGE LITTLE, JR.
A. C. McCALMAN
P. H. NIND
HON. WILLIAM RUSSELL
HON. W. F. H. SMITH
HON. W. A. G. YOUNG.

Curator of Museum :

Book Committee.

N. ATKINSON
REV. W. G. G. AUSTIN
A. G. M. CAMERON, M.D.
W. H. CAMPBELL, LL.D.
HIS HON. SIR D. P. CHALMERS
F. A. CONYERS
HON. N. DARNELL DAVIS
HIS HON. F. FLEMING
C. H. GILBERT
T. H. GLENNIE
B. J. GODFREY
G. H. HAWTAYNE
JOHN S. HILL
R. W. IMLACH
HIS HON. J. H. KING, B.A.
HENRY KIRKE, M.A.
REV. T. J. MOULDER
P. H. NIND
W. H. SHERLOCK
EXLEY PERCIVAL, B.A.
F. A. R. WINTER
VEN. ARCHDN. WYATT
HON. W. A. G. YOUNG.

Librarian : CHARLES CRUMPTON.

Resident Director in London :
WILLIAM WALKER, 48, Hilldrop Road, Tufnell Park, N.

Agents in London :
Messrs. RIDGWAY & SONS, 2, Waterloo Place, S.W.

Votes of Thanks—It was moved by the President, seconded by the Vice-President, and carried unanimously that the best thanks of the Society be given to Mr. Walker for his valuable services as resident Director in London during the past year.

The secretary stated that he was in regular correspondence, as to the business of the Society, with Mr. Walker, who was indefatigable in attending to its interests whenever he had an opportunity, more particularly in the selection of books for the library, transacting business in connection with exhibition matters, and in correspondence as to the appointment of a suitable person as curator of the Museum. It was then moved by Mr. Sherlock, seconded by Mr. Russell, and carried by acclamation, that the thanks of the Society be given to Mr. Mulligan for his services as President during the past year.

The Curatorship—Mr. C. Williams asked the President whether anything had been done with reference to the appointment of a curator for the Museum, and mentioned that he had brought the matter up for consideration of the Society three months ago. He further stated that the condition of the specimens in the Museum was such as to give him deep cause for regret, and trusted that an appointment would be made at an early date.

The President stated that it was desirable that an appointment should be made with as little delay as possible.

The Microscope—On the suggestion of Mr. C. Williams, it was agreed that Mr. im Thurn and Mr. Hawtayne, should be asked to prepare rules under which members of the Society would be allowed to

use the valuable microscope, lately presented by Mr. Reid.

Donation.—The following donation was announced and thanks ordered to be given to the donor.

By His Honour J. H. King.—The *Barbados Agricultural Gazette* for November.

The meeting then terminated.

INDEX

TO VOLUME 1

OF

TIMEHRI.

[N. B.—That this index has been made more comprehensive and elaborate than to some will, perhaps, seem necessary is due to the fact that this Journal is intended as a record of all ascertained facts concerning British Guiana; and its value as a record will obviously be greater in proportion as the means afforded of turning at once to any particular matter are easy. Each yearly volume will, therefore, be accompanied by a full index, partly alphabetical and partly classified, as in the present instance. ED.]

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